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THE annual exhibition of the American Institute was opened under auspicious circumstances during the current week.

WE have received from Prof. BENJAMIN SILLIMAN, of New Haven, an interesting sketch of the life and the scientific work of Dr. J. LAWRENCE SMITH, with a complete list of his published memoirs, prepared by appointment of the National Academy of Sciences.

LEAD has been at last allowed to follow the impulse upward that generally accompanies the busy season that we entered some time ago. Whether the metal will be able to hold its own for any length of time, depends chiefly upon the consumption. It is quite generally admitted that the production is little if any short of last year's make, the increase in some quarters making up for the decline in others. On the other hand, it would be vain to deny that consumption thus far has not been quite up to that of former years. It is possible, therefore, that, after the busy season has passed by, we may see lead recede again. It is in a position, however, owing to the fact that production and consumption are fairly balanced, where speculation may prevent any decline from present figures, and may even carry it upward. There are interests in the trade powerful enough to hold whatever surplus there may be at the end of the year, in anticipation of a revival of the demand. It is certain that, unless some new sources of supply are opened out, the output of lead will decline. Excepting the operations so auspiciously started last year in New Mexico, we do not know of the opening out of any new districts of prominence, and the threatened decline in some of the old ones, as the mines grow deeper and the character of the ores change unfavorably, will ultimately tell.

IN 1882, the Prussian Fire-Damp Commission made an elaborate investigation into the records of the accidents due to explosions of fire-damp, covering the period from 1861 to 1881, which compare with those of 1882 and 1883—the latter just received—as follows:

	1861 to 1881.	1882.	1883.
Total number of accidents	340	36	34
Number of mines in which happened	109	27	24
Men killed	846	122	94
Men injured	466	53	22
Coal mined per fatal accident, tons	1,663,516	1,311,202	1,491,817
Number of workmen employed per fatal accident.	7,555	4,789	5,415
Coal mined per death, tons	668,522	304,944	539,593
Number of workmen employed per death	3,0 6	1,413	1,959
Total explosions per one million tons production	0·60	0·76	0·67
Number of deaths per one million tons production	1·49	3·28	1·85
Total explosions per 1000 men employed	0·132	0·209	0·185
Number of deaths per 1000 men employed	0·329	0·708	0·511
Number of deaths per one million product, from mines at which explosions occurred	14·39	17·52	14·26
Number of deaths per 1000 men employed at mines at which explosions occurred	3·18	4·73	4·02

These figures show an improvement over the year 1882, which was characterized by the great Pluto explosion, which killed 65 men; but 1883 does not make as good a showing as the average of the twenty years from 1861 to 1881.

THE *Revista Minera y Metalurgica*, of Madrid, gives a number of interesting abstracts from the reports of a number of Spanish mines. The Compañía de Aguilas during 1883 suffered, of course, from the decline of values, which is estimated to have diminished the receipts, as compared with 1882 by about 410,000 francs. In 1883, the company produced 32,024 tons of argentiferous lead ores, 51,532 tons of low-grade concentrating ore, 10,659 tons of silver ore, 85,758 tons of iron ore, and 876 tons of copper ore. It made 13,199 tons of base bullion. Its receipts were 2,378,040 francs, from which, deducting 982,802 francs for expenditures, leaves 1,395,238 as gross profits. Out of this sum, 130.000 francs were used to retire shares, 63,262 francs went to the sinking fund, and 1,200,000 francs were paid in dividends, at the rate of 20 francs a share.

The Real Compañía Asturiana, in spite of a falling off in the price of zinc, by 10 per cent, and of 11 per cent in that of lead, as compared with 1882, obtained a gross profit of 1,909,292 francs, after writing off 500,000 for depreciation of plant. This profit was distributed as follows: Reserve fund, 331,858 francs; interest, 177,434 francs; and dividends, 70 francs a share, or 400,000 francs. This does not look encouraging for the anticipated decline of the output of the Spanish lead mines.

WHAT curious explanations the English public is expected to accept for the decline of copper is illustrated by the following extract from the circular of a London mining share broker, who says on the subject of copper:

"We look for a further fall in the price of the metal, and it is very likely to be brought about by the action of one man, an American. The Butte District of Montana is now the greatest copper-producing district in the United States. The largest mines are owned by one of the keenest mining speculators in America, and it appears to us that the game as played is to reduce the price of copper, so as to freeze out all smaller concerns and control the district. American copper has now a very sensible effect on prices, so we look for a reduction in the price of the metal, and then a rebound."

We expect to see the "small fry" of Butte exhibit all the symptoms of exposure to great cold. All the misguided copper producers of Butte who have been increasing their plant in ignorance of the deep schemes of the "keenest mining speculator in America" will now curse the day when they were inspired with the idea that, because they were making money with a small plant, they could make more with a bigger one. For the information of our English friends, we may state that they will go right on so long as they can make profits, quite irrespective of purely imaginary "freezing operations."

THE Electrical Exhibition now held under the auspices of the Franklin Institute at Philadelphia may be pronounced a decided and flattering success, so far as participation by Americans is concerned. To one who has not devoted all his time during the past in following the development of the application of electricity in lighting, the transmission of sound, etc., there is something bewildering in the gigantic strides made during so short a period. Those "who knew all about it" a few years ago would only pass an hour in the Philadelphia Electrical Exhibition to reach the conclusion that they had better resign such pretensions and leave the field to the pushing specialists who

are now exploring it. There are comparatively few exhibits that appeal directly to the mining engineer or metallurgist: the great questions to him of the transmission of power by electricity, of underground lighting, of electrolytic separation of metals, are not such as he might expect to see solved by a display. But a splendid opportunity is afforded to examine and compare the work of different engineers for driving dynamo machinery, and for observing the wide variations in the construction of the latter. We understand that a very thorough series of tests is to be made by eminent electricians and physicists, to the publication of which all interested will look forward. There are many features connected with the exhibition that, illustrating as they do the wonderful achievements of late years, will interest engineers in a general way. Among the latter is the synchronous multiplex telegraph system, which permits of sending as many as seventy-two messages over one wire at one time, the synchronous time telegraph system, by which a large number of clocks on one circuit are kept running from one central regulator, etc. In the evenings, the effect of the thousands of arc and incandescent lights is wonderfully brilliant, though the crowds that generally assemble make it difficult to do any more serious work. During the first week, some of the exhibitors were not quite ready, as is generally the case. Now every thing is running smoothly, and a journey to Philadelphia is well repaid.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

Duncan Concentrators versus Frue Vanners.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your issue of September 6th, you publish a letter by Walter McDermott, in which he comments at some length on the statements of Col. I. E. James, published in your issue of August 30th, in regard to a trial run made in February and March, 1884, between the Frue vanner and Duncan concentrators, at the Carlisle mill, New Mexico. Mr. McDermott and other vanner agents bring forward the very plausible argument that, inasmuch as Frue vanners were at the time of said trial placed in the mill on trial, to be paid for if satisfactory and returned if not, and as five additional vanners were ordered immediately after the trial of the said machines and all retained, perforce Colonel James's actions belie his words.

The facts of the case are these: Experience had taught us that the Duncan concentrators we had in use, eight in number, were not of sufficient capacity to successfully handle the pulp from our twenty-stamp mill, and on the representations of the Denver agent of the Frue vanners that five vanners would work out all the tailings from all the concentrating machinery then in use, and save therefrom a large amount of mineral, five vanners were taken on trial on the conditions named in the contract. After they were duly put in place by the Denver agent, we tried them on the tailings from the Duncans, but found them incapable of handling the amount of material for which they were recommended. We thereupon made a trial run of the two machines on the same amount and quality of pulp from the batteries, with the results named in Colonel James's statement; but finding them to be good auxiliaries to the Duncans, and able to relieve those machines in a measure, and having them well set up and in good running order, I advised Colonel James to pay for and retain them, which was done, but has since been regretted, as the management considers that a less number of Duncans would have answered the purpose for which the vanners are employed, with better results and fewer attendants.

The five additional vanners were ordered by interested parties in Chicago, as we suppose, after they had been plied with numerous sophistries and plausible but impracticable theories without consulting the management here.

The gentleman makes a true statement when he says that it is possible to so run a vanner that a Duncan concentrator will give better results, and I do not hesitate to add that it is *impossible* to so run one that it will give better results than a Duncan on our ore.

Two other points about the test are noted and commented on—one the relative cleanliness of the concentrates. The fact that those from the Duncan were the best is looked upon as something miraculous and an insinuation again added that the test was not fair. But this point, as well as the gold-saving properties of both machines, can best be decided by watching them at work and taking the results for your guidance.

In reference to the saving of amalgam quoted in the test, Mr. McDermott comes forward with the very lame excuse that the vanners were not ordered for this, which is true; but they were highly recommended for this purpose by the Denver agent. "And the copper plates with ¼-inch riffles at top and bottom for ordinary pulp distributor on vanner, . . . the most effective amalgam concentrator possible to conceive," in the language of Mr. McDermott, were furnished and put in position by the Denver agent, prior to the said trial, and proved a total failure in our case and a hinderance to the good working of the machine.

He also jumps at the conclusion that the gold caught in the Duncan concentrators passes from the copper plates in globules of quicksilver, as if we used silver by the bucketful. Will the gentleman please know that we have ordinary intelligence in regard to using silver on copper plates for amalgamating purposes? Yours respectfully, W. E. STIRK.

CARLISLE, N. M., Sept. 20, 1884.

[Believing that we have afforded both parties to the discussion a full opportunity to express their views on the test in question, we must decline for the present to print any further communications on the subject, because they threaten to drift into a debate in which the public can have no interest. We shall be pleased to place before our readers a full account of the results of any further tests made under conditions that will be acknowledged by all parties to be equitable to their interests. We would suggest here that in any further tests made the results be reported in ounces instead of dollars, and that the assay of the tailings from both machines be appended. We shall be pleased to make room for suggestions as to the data necessary to reflect in the fairest manner the comparative work of the two machines.—EDITOR ENGINEERING AND MINING JOURNAL.]

OFFICIAL STATEMENTS AND REPORTS.

THE SIERRA GRANDE, SIERRA BELLA, AND SIERRA APACHE MINING COMPANIES, LAKE VALLEY, NEW MEXICO.

The reports of these companies, which at one time were the object of so much interest and of so much exaggeration, are this year the most comprehensive and instructive documents yet issued, and reflect clearly the change of management made about a year ago, when Dr. F. M. Endlich took charge. Dr. Endlich has striven to take up the dead-work hitherto not kept up sufficiently, calling to his aid a diamond drill, and putting in a plant of Ingersoll drills for the Sierra Grande mine. The discovery of the famous Bridal Chamber seems to have led to concentration of work at a few points, with the result that its exhaustion caused the mine to drop off suddenly. From all we can gather from Dr. Endlich's report, his policy seems to be the extraction of growing quantities of paying grades of ore, thus putting the mine on a sound financial basis and leading to the discovery of bodies of high-grade ore as welcome contingencies, swelling the profits, though their absence does not threaten the life of the mine. The future of the Lake Valley mines seems to lie in the large bodies of low-grade ore; and with an intelligent appreciation of this fact, Dr. Endlich's efforts are directed to making extensive openings, to cheapening the cost of working, and to working out the problem of treating low-grade ores on the spot with a profit. The bonanza craze is evidently past, although it is by no means impossible that rich pockets rivaling the Bridal Chamber may not be opened in regular mining work. Dr. Endlich reports that on an average about 85 per cent of the labor employed was occupied in production and the rest in dead-work. The bulk of the ore mined has been shipped to the Pueblo Smelting and Refining Company, and a contract recently made admits of the utilization of lower grade ore than that shipped hitherto. Dr. Endlich states that 25-ounce ore yields a fair profit to the mine. The Sierra Grande mine has a 20-stamp mill which in the past has worked on Bridal Chamber ore, and is somewhat famous as having produced 60-ounce tailings. Dr. Endlich states that there are nearly half a million of dollars in that precious pile. He tried, after thoroughly repairing the mill, to work 15-ounce ore profitably, but failed. He adds, however: "Owing to the high prices of fuel and all other supplies as well as the high rates of freight, caused by the absence of railroad communication at the time of running the mill, owing further to the expense of supplying the mill with water, and owing further to the refractory character of a large mass of our ores, I found that ores averaging from seventeen to eighteen ounces a ton merely paid expenses. With the reduced rates we now have, and the increased facilities for transportation from the mines, I consider it possible to pay expenses with ores averaging about fifteen ounces per ton. Much of the ore can not be worked to more than fifty per cent of its assay value, while some classes reach as high as eighty-five per cent. I would suggest, therefore, that the mill be kept in good working condition, that ores not suited for treatment therein be disposed of under our contract, and that the mill be put in operation on ores suitable for amalgamation process, whenever a sufficient tonnage of such ores may have accumulated. The Frue concentrators put into the mill paid for themselves and yielded a small profit during the three and one half months they were in active operation.

"During the past year, we have shipped from the Sierra Grande, Bella, and Apache mines, respectively, about 8560 tons, 2630 tons, 800 tons, making a total of about 12,000 tons. On this tonnage, we have paid, in the form of freights and cost of treatment, the sum of about $260,000, making $21.50 per ton. It is evident, therefore, that, under existing circumstances, all ores of smaller value than 22 ounces per ton are not marketable. As the capacity of the mill is limited to about 60 tons of ferruginous or manganiferous ore, and to 33 tons of siliceous ores per day, and as our total output even now is greater than the capacity of the mill, and as this output can be readily increased to a still higher tonnage, and it becomes necessary to find some means of utilizing ores in large quantities, showing an average value of 22 ounces or lower, three expedients are open:

"(1st.) The diminution of tonnage of low-grade ores by means of concentration, which secures a corresponding increase of value per ton.

"(2d.) The increase of milling capacity.

"(3d.) The means of treating large quantities of ores at the mines by smelting.

"(1.) The application of concentrating methods postulates the reduction to pulp of all ores thus treated. This involves, apart from the concentrating machinery proper, an extensive plant for crushing or stamping the ore, in order to reduce it to the mechanical fineness required. This again requires an amount of water which can not be furnished without expending considerable amounts of money on a heavy drain and pumping plant.

"(2.) An increase of present milling capacity might be made to such extent as the conditions and strength of the present motive power will warrant. Such increase I assume to be from fifty to seventy-five per cent of the present capacity, which would then enable us to treat proportionately more ore. As, however, the additional building and machinery would involve a considerable outlay of money, and as the existing mill already requires much repairing after comparatively short runs, the advisability of this change seems questionable.

"(3.) The smelting qualities of your ores have been demonstrated, and their variety of mineralogical character is, in my opinion, sufficiently great to admit of making proper and desirable mixtures; they contain, however, not a sufficient amount of lead to be smelting ores, properly speaking. It would be necessary, therefore, to acquire, by lease or purchase, lead ores or lead mines of a suitable

character to supply the deficiency in your own ores. A smelting plant of a capacity of, say, 150 tons per day, properly constructed, should not exceed in cost more than double the amount which would be required to increase the present capacity of the mill by seventy-five per cent, and should not cost as much as a plant for concentrating an equal amount of ore per day. After careful calculations, based upon the condition that lead ores in sufficient quantities and of suitable character should be obtained, which lead ores, however, would not be expected to yield any profit whatever, I place the cost of smelting at Lake Valley at from fifty to sixty per cent of the cost of transportation and treatment of ores during the past year.

"The resources of your mines, so far as they pertain to ores running from ten to thirty ounces per ton, are now known to be very great indeed, and before long the utilization of these grades will, no doubt, enter largely into the question of your future revenues. You have, in your mines, a gross value of very large amount, and it now remains to decide upon the best and most feasible methods of obtaining from this supply the greatest possible percentage of net returns."

In connection with this subject we may be permitted to suggest that certain classes of low-grade ore could probably be treated in the most satisfactory way by the Russell leaching process, which we understand is now at work in one locality with ores as low as $10, similar in many respects to the siliceous Sierra Grande material.

On the geology of the ore-deposits and the character of the ores, Dr. Endlich makes the following report, which places many points in a light somewhat different from that thrown upon it by those who have described it in the past:

"As the geological character of your mines has been the subject of much speculation, some decided opinions, and a little systematic study, it may be well to give a very brief synopsis of the actual information thus far obtained in regard thereto. In so doing, I shall not confine myself to the Grande property alone, but treat the properties of all three companies as a whole.

"The ore bodies, to use a very general term, are contained in limestones of Carboniferous age. They are principally found at a definite, well-determined horizon, within a zone of somewhat varying vertical extent. This horizon is defined by the originally horizontal contact of two different limestones. Of these, the lower (normal foot-wall) is hard, more or less siliceous, of a blue color, and it contains but very few fossils. The upper (normal hanging-wall) is light gray, white upon exposure, devoid of siliceous inclusions, and highly fossiliferous. Between these two different limestones, which show a general dip of about fifteen degrees to the southeast, we find the deposits of ore. At some points, the ore runs downward into the foot-wall, filling fissures or cavities, or the ore has gradually replaced some of the single layers of the blue foot-wall limestone. Extensions of the ore into the hanging-wall are comparatively rare, with the exception of differences caused by local thickening or thinning of the ore-bodies; these latter are regularly conformable with the limestones, and participate with the latter in whatever results of stratigraphical disturbances they may exhibit.

"Taken as an entirety, the ore bodies of the Sierra mines under consideration present all the characteristics of a bed or stratum. Taken in detail, this bed resolves itself into a more or less continuous series of beds of varying thickness and subject to intercalations of limestones. At some points, the latter become so prominent that two distinct beds may be found, separated by as much as twenty-five feet of limestone. At other points, the horizontal connection between two neighboring beds appears to be broken, but the proper continuation will be found by exploration at the normal horizon. Taking a section transversely across the claims, the ore-deposits would represent a waving line, thickening, thinning, and at some places temporarily interrupted.

"In every respect, this series of ore-beds may be considered as an integral member of the sedimentary formation of that locality. The position of the series is thoroughly well defined, and although local interruptions may tend to confuse the conception of the whole, yet the persistence and regularity of this series of beds at the horizon above described is now established over a considerable area. By means of mining work and the diamond drill, we have determined thus far the existence of the beds for about 3500 feet along their strike, and for about 500 feet along their dip. The interruptions above alluded to are of comparatively small extent, as are the thinning portions of the ore-bodies, but their occurrence forces us to regard the ore-deposits, when critically considered, as a series of beds rather than as one bed. To put the matter into concrete shape, we may, in a general way, compare the ore-bodies to a series of huge bi-convex lenses of varying sizes, more or less closely connected with each other, and of varying thickness.

"As a rule, we find flinty ores to compose the upper, higher beds, while ferriferous manganiferous ores comprise the lower. On the Grande, this characteristic is prominently marked, and here, too, the intercalations of limestones between the beds are most noticeable. This latter feature has become so well defined that at certain points we can correctly speak of two beds. Some distance off, the interposed limestones gradually thin out, and the two beds come together, each, however, retaining its original thickness. On Bella, the beds are more regular, as regards any separation by limestones, but in all other respects they agree closely with those on the Grande.

"An important feature in the structure of the ore-bodies, and one bearing on their vertical distribution, lies in the fact that they have participated in the various disturbances to which the strata inclosing them have been subjected. This fact points to the correctness of the assumption that they must be regarded as integral portions of the formation in which they occur, and has an important bearing in favor of the question concerning their ultimate extent and permanence. Vertical, or nearly so, displacements have affected the limestones at numerous points. In most cases, the throw, either up or down, has been comparatively small; in some cases, great. In all cases, however, the ore-beds have been cut by these faults in precisely the same manner as the over and underlying strata have been. Thus the further continuation of an ore-body may come to an abrupt termination without warning. Proper mining, however, can generally recover the ore without much trouble.

"The main bulk of the ores are limonitic and manganiferous, or both, containing chlorides or bromo-chlorides of silver in varying quantities. The upper beds on the Grande are flinty, sometimes almost pure silica. Plumbiferous ores occur principally in connection with the ferriferous, although they are hardly ever missing from the siliceous ores, but in the latter case their quantity is small.

"As to the distribution of the specific silver minerals, that is, chlorides and bromo-chlorides, within the limits of the ore-bodies, or so far as their association with the ordinary ores is concerned, I have been able to deduce only two rules thus far, namely: 1st. Wherever the ore-body becomes exceptionally thick, this thickness not being due to inclined position alone, at such points rich ores may be expected; and 2d. Wherever lead ores begin to appear, rich ores are almost sure to follow shortly. No applicable information, that is, such as might lead to *a priori* reasoning as to the location of rich ores, has been obtained as yet, with the single exception of the facts that wherever found they show a tendency to follow the hanging-wall, and in some instances to run along one or the other side of a fault.

"Rank of ores depends upon local conditions, such as cost of extraction, transportation, treatment, etc., so that, while a given grade of ore might rank as 'medium' or even 'high,' this same grade elsewhere might be regarded as 'low.' Our standard is a high one, and we rank all ores containing less than forty ounces of silver to the ton as 'low grade.' This statement will suffice to explain what is said below. Taken as a whole, the bulk of our ores are low grade, much of it running down as low as fifteen to twenty ounces. On the other hand, the mines have produced and are producing an exceptionally large quantity of high-grade ores. Referring to the tonnage of ores milled and on hand, all of which ranks as low grade, and comparing the same with the tonnage shipped, it will be found that fully seventy-five per cent of the ores extracted during the last year were low grade. It must be remembered, however, that this class of ores was only taken out in the prosecution of regular mining, or prospecting-work, so that the *true* proportion will be nearer ninety per cent than the figures above given. This calculation leaves entirely out of consideration the existence of any deposits like the Bridal Chamber, and refers to last year only.

"As stated above, the existence of the series of ore-beds has been proved for a distance of about 3500 feet along their strike. Only two interruptions of any consequence exist along this line. One of them is undoubtedly due to erosion, the other is due in part to faults, in part, probably, to a thinning out of the ore-bodies. Along the entire line, the main bulk of the ore is low grade, but at frequent intervals we have struck exceptionally rich deposits. I would refer to the ores of Grande No. 10, Bridal Chamber, Grande No. 7, Columbia on the Bella, and Apache No. 1, all of which points lie along the line mentioned, or very near it. Along the dip, at right angles to the strike, we have established the existence of ore for about 500 feet, and have opened up considerable portions of it. As the most prominent instances of striking rich ores in the line of the dip, I would refer to the ores in the 'Last Chance' of the Bella, running downward with the dip, and of the upper workings of Grande No. 10, running upward against the dip. As to the quantity of the ores with which we have to deal there can be no question, and the only point to be considered is their value. We have found that the rich ores are not confined to any one zone, locality, or direction, and we are fully justified in expecting from future developments of the area known to contain ore results similar to those obtained heretofore. The limits of this area are rapidly extended by the process of regular mining and with the aid of the diamond drills. As we have, thus far, systematically explored less than one tenth of the entire area controlled by the three companies, we are safe in saying that our work must be considered as still being in its infancy at present.

"Leaving aside all hypothetical speculations as to future possibilities of the productiveness of the mines, and coming down to the hard facts of the case, we find as follows:

"(1st) The working of the mines has yielded a profit.

"(2d.) The more extended the work became, the better were the results that is, the more ground has been opened, the more ore was found.

"(3d.) The more ore was taken out, and the more prospecting was done, the more apparent became the permanency and structural regularity of the ore-bodies.

"These results, together with the knowledge of structure and distribution, now at our command, entitle us to the deduction that, in so far as our explorations develop the existence of ore for increased areas, in so far may we expect a recurrence of the revenues derived from the limited area already worked over. Further, our experience has shown that while the succession and continuation of ore-bodies of average grade are remarkably uniform and regular, the occurrence of unusually rich ores is erratic, and we have the right to assume that, so long as we find and develop the normal ore-deposits, we may, at any time, encounter bodies of rich ore similar to those heretofore met with.

"The absence of any regularity in the accumulation of the specific silver minerals throughout the ore-bodies, and the impossibility of finding, thus far, any decisive structural mineralogical or chemical cause for such accumulations, leads to the inference that the output of highly valuable ores will appear more or less irregular, if short periods of time only are taken as standards for comparison. This feature of the work can be and is now, in part, met by the introduction of appliances for the rapid prosecution of development and exploration."

Turning to the financial statements of the Sierra Grande Company, we find that the receipts were $453,055.89 for sales of ore, $9598.10 from concentrators, $55,140.68 from bullion produced by the mill, $195,804.93 from sales of Bella ore, $16,262,55 from sales of Apache ore; the cash balance on August 11th being $84,277.67, against $52,911.72 on August 15th, 1883. The expenditures include $431,654.49 remitted to the general manager, $4500 for the diamond drill, $15,000 advance on freight to secure railroad connection from North Station to Lake Valley, $5162.40 for Frue vanners, $21,900 compromise of suit of Taber & Wurtzbach, $160,000 for dividends Nos. 7 and 8, $50,476.73 to Bella Mining Company, and $1074.87 to Apache Mining Company.

THE Quebrada Railroad, Land, and Cable Company, of Venezuela, produced in 1883 in all, in the shape of ore and metal, 3588 tons of metallic copper, the operations showing a loss of £3963 during the year.

THE DISTRIBUTION OF SAN JUAN COUNTY ORES.—I.

By Theodore B. Comstock.

GENERAL GEOLOGICAL HISTORY AND GEOGRAPHICAL DISTRIBUTION OF MINERAL BELTS.

In my last communication to the JOURNAL, published in your issue of August 23d, 1884, I discussed at some length the subject of local reduction-works, expressing very decidedly the opinion that this is not the place for such plants. Inadvertently, I also stated that "there are some excellent opportunities for the investment of capital in metallurgical works designed for the reduction of certain classes of our ores." The implied contradiction should have been overcome by the addition of the words, "at or near the great centers of trade, as at Pueblo or Durango." I have yet much to say on this topic, but it will be best first to outline the situation by a somewhat detailed description of the territory, with especial reference to the courses and qualities of the veins in different districts.

There are few sections affording such a wide variety of minerals, with as well-defined lines of settlement for each particular group, as the region including the greater part of San Juan County, Colorado, with adjacent portions of Hinsdale, Ouray, San Miguel, and Dolores counties. The beautiful system that I am about to portray is not, however, to be discerned at a glance by the casual tourist, nor it is readily understood without the accumulation of an immense store of facts. For more than five years, the writer has diligently studied the problems involved, and it is only within the past few months that a fairly satisfactory solution has been reached. The more detailed work of the United States Geological Survey, with the aid of minutely accurate maps, will probably require some modifications of my own results; but I am confident that the general statement of principles that follows is correct in all substantial points. The data here given will, at all events, be found sufficiently accurate to enable an investor to choose understandingly from among the properties offered him, so far as present developments go.

If we start at any point within the district aforementioned, we may observe two or more sets of veins. Selecting one of the largest and most easily traced, we can usually follow it in the direction of the interior of the district, and often for miles, along its outcrop. In pursuing this course, other prominent veins will be seen to take the same general direction; but, if carefully mapped, or if followed by long distances, it will be noticed that the neighboring fissures gradually converge toward a point within the area described. As we pass along each radial line, we shall cross numerous intersecting veins, usually less prominent than the main fissures (though with important exceptions), and the trained eye of the field geologist will at once detect two or more trends in these cross-veins. A little study will also show that, as a rule, the best of the cross-veins (as regards quality and quantity of mineral contents) join the main veins at about the same angles in all cases, though the trends may vary considerably with respect to the meridian.

Further examinaiion will demonstrate two other important characteristics, namely: (1) That these cross-veins have not broken the main veins at the points of intersection, but that the lines of junction are invariably "anastomosed" or knit together as a vein and its feeders; and (2) That the cross-veins of this type are usually, if not always, following practically the courses of lines of jointage fracture upon a large scale. From these facts, I deduce the rational conclusion that both the main veins and this series of cross-veins all belong to synchronous periods of vein formation, and that both may be regarded as the *primary* veins of this region.

We still meet with another series of veins crossing the main veins, and in some cases the *primary cross-veins* themselves. These veins have invariably broken the *primary* veins of both sets at the crossings, and have often caused excessive shiftings of the latter horizontally (as well as vertically, judging from the occurrence of "slickensides"). Closer examination of a large number of examples from many localities brings out the additional fact that these *secondary* veins are not strictly parallel, each to each, but that they commonly converge more rapidly than the main veins, seeking local centers. By carefully tracing a number of these lines, I have been able to determine that certain prominent peaks (as Handie's Peak, in Hinsdale County, a point on Engineer Mountain, on the line between San Juan County and Hinsdale County, Kendall Mountain, near Silverton, and others) are the *foci* of secondary veins, while some of the most prominent points in the present topography of the district are not the centers of any vein system.* It is significant that the secondary centers of eruption, or the positions of the latest craters, as determined by this method of investigation, lie almost directly in the central lines of the zones of mineral deposition, as we have yet to define them.

In a paper designed for a more professional audience (the American Institute of Mining Engineers), I am preparing a series of maps and diagrams that will fully illustrate the points here outlined. In this place, it will only be possible to give the conclusions reached, with enough of the facts and argument to convince the reader that the generalizations are well-founded and not mere theoretical ideas. Hence, without further dissertation, it may be remarked that a vast array of facts all go to prove that the area now known as the Red Mountain Mining District, in Ouray and San Juan counties, occupies the position of an ancient volcanic crater, from which the trachytic layers of the surrounding country were thrown out in such a manner as to produce eventually six radial fissures, extending for miles in as many directions from this central area. Each of these six fissures afterward became the seat of more or less specialized action, causing the production of mineral deposits of individual character in each case. The central area itself manifested all the phenomena of secondary volcanic action, as exhibited in thermal springs, including geysers of greater magnitude than any now existing, even in the Yellowstone National Park.† Over this tract, which is somewhat limited in extent, there is comparatively little to guide one in the search for veins, as the bodies of ore fill usually the old bowls and subterranean passages of extinct springs and geysers. Perhaps the only general rule that can be given is to work in the mounds that abound in all directions over this territory, hundreds of which have not yet been explored. But tehse surface deposits, for reasons that will be given beyond, are not as reliable or presumably as valuable as will be hereafter discovered in the deeper workings of the mines, except in certain peculiar instances.

These mounds, which mark the positions of former springs, are not confined to the Red Mountain area. In many other parts of the territory we are considering, there are smaller areas that were at one time only less prominent. As a rule that is rigidly applicable to three of the radial zones, and in less degree to the remaining three, these ancient areas of thermal spring activity are closely clustered along the lines of the great central radial fissures. At a distance of from eight to fourteen miles from the center of the Red Mountain crater, each of the six radial fissures has built up a secondary crater, through which local lava streams have poured, followed by the filling of the secondary veins through the agency of hot springs. Thus, I have been able to detect, through familiarity with the Yellowstone Springs and their deposits, very numerous evidences of the life-history of our veins, which would otherwise have been inexplicable.*

Rather oddly, using Red Peak as a center, the ten-mile circle passes directly through the towns and settlements of Ouray, Rose's Cabin, Highland Mary, and Ames. The seven-mile circle strikes Mineral Point, Animas Forks (nearly), Eureka, Middleton, Howardsville, and Ophir (closely). Telluride and Silverton lie exactly upon the six-mile circle, and Gladstone, Chattanooga, and Red Mountain Town all lie within one fourth mile of the two-mile circle. These remarkable coincidences can not, of course, be accidental, but a glance at a correct map,† aided by the foregoing remarks, will explain the matter fully. Animas Forks, Eureka, Middleton, and Howardsville are all upon the same stream, and this shows that the general course of the Animas River over the intervening distances, as well as the creek upon which Mineral Creek is located, pursues a course closely identical with an arc of a circle whose radii center at Red Peak. And this peculiarity is not confined to these streams, but is quite noticeable in all the valleys. A circle drawn with Red Peak as its center, and with a radius of three fourths of a mile, includes sources of the Animas, San Miguel, and Uncompahgre rivers, and yet the Peak itself is not a remarkably high point. The upper valleys of these rivers are concentrically disposed, with the old rim of the crater walling them in on all sides. A secondary series of similar rings is also noticeable about the secondary craters, of which the centers are approximately defined by prominent points in the rims. These points are: (1.) A point on Engineer Mountain, on the line between San Juan and Hinsdale counties, separating the sources of the Animas, Gunnison, and Uncompahgre rivers; (2.) Handie's Peak, in Hinsdale County, dividing Lake Fork and Henson Creek (Gunnison) and small tributaries of the Animas drainage; (3.) A high point in the Continental Divide (or between it and Kendall Mountain) at the sources of tributaries of the Rio Grande and Animas; (4.) A point near the junction of the lines of San Miguel, San Juan, and Dolores counties (Lost? Peak), at the sources of the Animas, Dolores, and San Miguel rivers; (5.) Glacier Peak, dividing the waters of the Dolores and San Miguel, on the line between the counties of the same names; (6.) Mount Sneffels, the water-shed for sources of the San Miguel and Uncompahgre rivers.

If we trace the lines bearing from Red Peak toward each of these points, we shall lay out the central lines of six well-defined mineral belts, all agreeing in some important particulars, but in many respects dissimilar. Leaving the special features of each for discussion in future issues of the JOURNAL, I give here such characters as are common to all, with some modes of determining by inspection the relations of any given vein of the *primary* series to the central portion of the belt or zone in which it lies.

The radial fissures are filled with minerals that give character to their own individual zones, and, so far as the silver contents are concerned, each zone represents a distinctive type of vein-texture; but all the zones agree in this, that the central line, or *parent fissure*, of each is nearly vertical and gold-bearing. Upon each side of the central line, the veins will be found less inclined and dipping toward the *parent* fissure, more or less as one passes from center to outside of the zone, in each direction. Near the boundary lines between adjacent zones, the veins become less numerous and less valuable, with usually a dividing area that is nearly or quite barren.

Provisionally, I have marked out the six zones, geographically, as follows:

1. The Engineer Mountain area, with a width at the ten-mile circle of 4½ miles, including Mineral Point and adjacent territory,

2. The Handie's Peak area, 10 miles wide at the ten-mile circle, including Capitol, Sherman, Animas Forks, Eureka, Middleton, and Gladstone.

3. The Continental area, so-called, 11 miles in width at the ten-mile circle, including the towns of Howardsville and Silverton.

4. The Lost Peak area, 9 miles wide at the ten-mile circle, with Chattanooga as the only existing town.

5. The Glacier Peak area, 3 miles wide at the ten-mile circle, including the towns of Ophir and Ames.

6. The Mount Sneffels area, 17 miles wide at the ten-mile circle, including San Miguel, Telluride, Red Mountain Town, Ironton, and Ouray.‡

From this brief review, the intelligent observer may glean enough to gain a very reasonable idea of the prospective value of mining claims in

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* Notes on the Geology and Mineralogy of San Juan County, Colorado. By Theodore B. Comstock. Read at the Colorado Meeting of the American Institute of Mining Engineers, August, 1882. Reprint, p. 23.

† Geological Report of the N. W. Wyoming Expedition under Capt. W. A. Jones, 1873. Special edition from office of Chief of Engineers, U. S. A. Chaps. VIII., *et seq.* By Theodore B. Comstock.

* The study of the geology of this region, which will do more than any thing else to advance our knowledge of vein-formation, will be as much a sealed book to geologists as was the origin of the glacial drift before Agassiz's noted observations, until the Yellowstone Park Region becomes thoroughly familiarized. Detailed observations in that section ought to be constantly made and recorded under the auspices of the Geological Survey.

† I get these data by plotting the circles upon a map constructed by myself in 1882, and published with my paper previously cited "On the Geology, etc., of San Juan County." The facts here announced were unknown to me then, and the results were as startling to me as to my readers. The map in question is as accurate as could be made from the published surveys. Telluride is, however, located one mile above its true position, the correction having been made before drawing the circles.

‡ This district may require require division into two zones; but as yet I have been unable to discover such facts as will permit me to safely anticipate the results of more extended examination.

given localities, so far as mere general indications go. With a good map, carefully blocked out, such as I now use in my explorations, the investor may obtain a very fair notion of the probable outcome of judicious investment, locality alone considered. In future letters, I will take up each zone by itself, and endeavor to show the real merits of each, economically considered, with special reference to the principles here set forth.

SILVERTON, COLO., Sept. 12, 1884.

THE LAWSON NON-EXPLOSIVE BOILER.

In 1848, Mr. Daniel T. Lawson, of Wellsville, Ohio, was eye-witness of the explosion of the ferry-boat Island Packet at Wheeling, West Va., an occurrence that made so deep an impression on him that he began the study of avoiding similar catastrophes. He developed a theory that was sharply criticised, but early in 1881 he ordered a boiler from W. W. Roberts, of Wellsville, Ohio, the plates being made by Philips, Nimick & Co., of Pittsburg, and on the 16th of June, 1881, exploded it in the presence of witnesses at Menshall, Pa. On the 22d of March of the next year, a commission of government engineers, consisting of John Fehrenbatch, supervising inspector of steam vessels, G. H. Atkinson, inspector of boilers of steam vessels, and A. S. Batchelor, assistant-inspector, tested a boiler constructed in accordance with Lawson's designs. The boiler, having the Lawson diaphragm and being 30 inches in diameter, with only 18 inches of water running down to 11 inches, 4 inches below the fire-line, stood every test of rapid escape and sudden check of steam up to a pressure of 300 pounds, without the slightest injury. The same boiler with the center of the diaphragm removed, reducing it to the ordinary style boiler, with 22 inches of water, 7 inches above the fire-line, was exploded at a pressure of only 235 pounds—65 pounds less than the same boiler had withstood with Lawson's device, under precisely the same circumstances, except as to the quantity of water. The members of the commission, in speaking of the test in their report, state: "We are convinced that the attachment to a boiler of a diaphragm such as, or similar to, the one employed while making the experiments, will, in a great measure, remove the dangers that now surround the management and use of steam-boilers. A boiler with such an apparatus attached is safer, for the reason that no concussions can take place in it. Aside from this, it strengthens the boiler, and in addition thereto it produces dry steam, a great desideratum in the running of steam-engines The experiments made have not proved the theory held by many, that low water is the cause of boiler explosions, to be correct."

Mr. Lawson's theory of the cause of explosion in boilers is formulated as follows by Mr. Thomas Hays:

"The water in the boiler, under pressure, is superheated and possesses a highly expansive power. Upon a sudden removal of the pressure, without a corresponding reduction of the temperature, it starts into violent evaporation. This mass of nascent steam is checked by coming in contact with the solid and unyielding shell of the boiler. The result is, that the aggregate force of this nascent steam strikes every square inch of the shell of the boiler at the same instant and with the same force, and with a power far in excess of the tensile strength of the boiler; and moreover, this force is augmented at the instant the shell gives way by an immense reserve power caused by the further evaporation of the water in the boiler."

Mr. Lawson's remedy is a simple one, and consists in the construction of a boiler with a partition-plate or diaphragm dividing it into two compartments, the lower containing the water, and the upper containing steam only. The steam passes from the lower to the upper compartment through numerous small perforations and a number of small valves in the diaphragm. The aggregate openings of the valves and perforations should be less than the valve through which the engine is supplied. By this means, the pressure on the surface of the superheated water is kept approximately uniform, and all sudden explosions of any dangerous quantity of water into steam, and consequent striking blows, are avoided.

The diaphragm extends the length and width of the boiler, and is firmly riveted to the sides and ends thereof, as shown by Figs. 1 and 2. It may be circular or flat and so located as to cut off about two thirds of the usual steam space.

The perforations and valves vary with boilers of different size. The aggregate area of all the perforations and valve orifices should be about ten per cent less than the area of the steam-port. In ordinary-sized boilers, there should be one perforation of one quarter of an inch in diameter to each horse-power, rating ten feet square of heating surface to the horse-power, and such number of valve orifices of about two inches in diameter as to make up the balance of the aggregate area.

This lessening of the aggregate area ten per cent below that of the steam port will give a very slight diminution of pressure in the engine with steam working at full stroke, but will give practically full pressure at every point of cut-off.

There must be two steam-gauges used, one connected with the water-space below, and one with the steam-space above, the diaphragm.

When the boiler is set and ready for use, such small valves should be closed. As the steam is generated and the engine put in operation at its full capacity, any additional steam required is obtained by gradually and partially opening the valves until the required amount is liberated and ascertained, when the valves are set, and need but little further attention. In thus arranging the valves, particular attention should be paid to the steam-gauges. The valves should be opened only to that extent at which the pressure upon the superheated water in the lower compartment, as shown by the gauges, remains approximately uniform with that in the upper, with the engine in full operation. Thus arranged, any unusual and sudden withdrawal of steam from the upper chamber is attended with no possible danger.

Boilers thus constructed and arranged are protected against explosions,

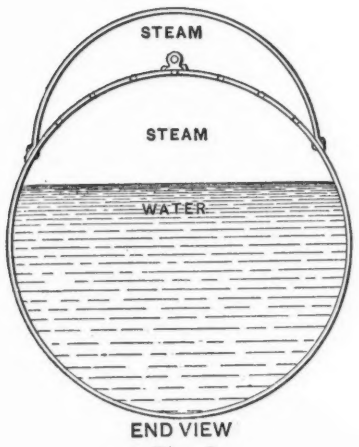

Fig. 3.

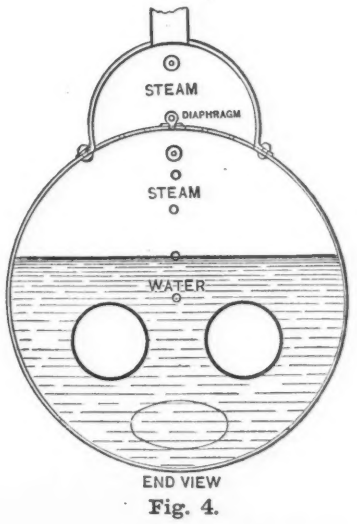

Fig. 4.

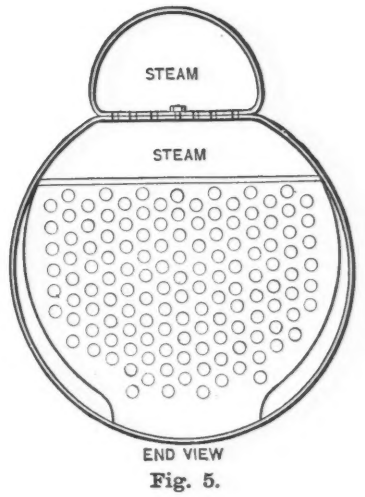

Fig. 5.

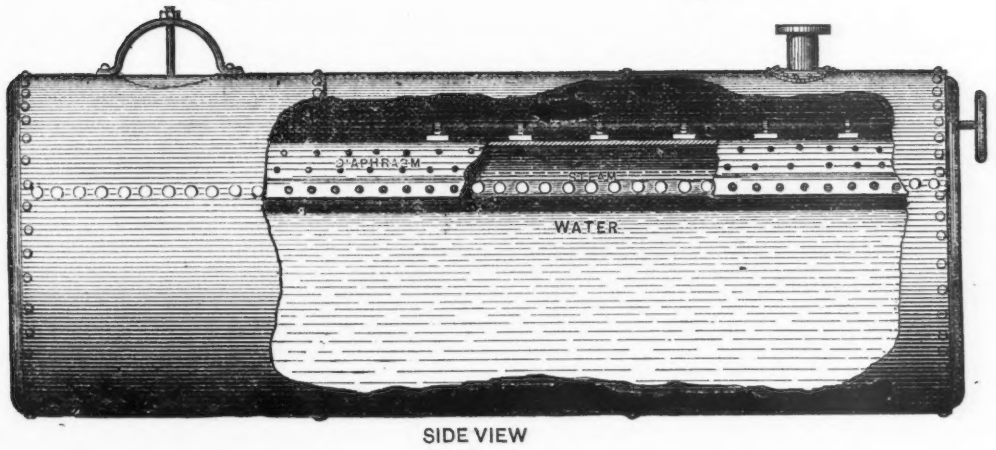

Fig. 1.

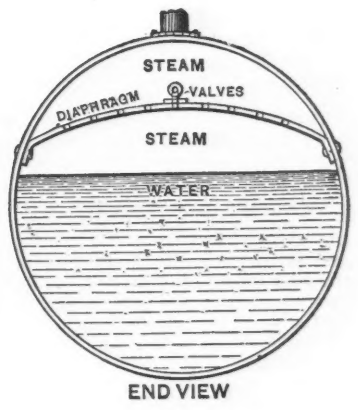

Fig. 2.

THE LAWSON NON-EXPLOSIVE BOILER.

whether the water wholly or partially fills the water compartment. If wholly filled, a sudden reduction of pressure in the steam compartment can instantly affect only the surface of the water to the extent of the aggregate area of the perforations and valve orifices, and no dangerous quantity of water can be thus exploded. As the pressure upon the water below the diaphragm is thus slightly reduced, small portions of the water pass into steam and maintain uniformity of pressure.

It is claimed in behalf of the Lawson boiler, by the Lawson Non-Explosive Boiler Company, of this city, that it removes all obstacles to the use of high pressure, that it prevents priming and foaming and the formation of incrustations.

THE PHILADELPHIA MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.—IV.

The discussion on Mr. Taylor's paper, printed in our last issue, was an animated one. It was opened by Dr. Raymond, who stated that he could see nothing in the lines of the furnace, *a priori*, to prove that it should, in the lapse of such a very short time after blowing in, come into the condition described. Mr. Edgar S. Cook, of the Warwick furnace, Pottstown, reported his observations of the working of the furnace during a visit to it. He referred to the fact that in furnaces in regular operation for a number of years, the boshes become cut away. The Warwick furnace, after being in blast three years and nine months, has to-day essentially the shape of Mr. Taylor's furnace. In July, 1883, Mr. Cook drilled a series of holes, thus obtaining the thickness of the walls at various points. At a point directly above the tuyeres, where originally the diameter had been six and a half feet, the size was found to be fourteen feet, and for a distance of ten feet, it ran very nearly straight vertically. At this point, the walls were about six inches thick only. A trial made a week ago proved that the thickness of the walls was the same as it was in July, 1883, the furnace having been worked all that time on material that filled in against the wall, and not on the brick. It is only when the furnace has filled up with finely divided ore, and the diameter of the furnace is reduced to probably ten or eleven feet instead of fourteen, that the furnace does the most economical work, producing as it did from 450 to 475 tons of iron a week, and on one occasion even 507 tons, with a low consumption of fuel, namely, from 1 ton 3 cwts. to 1 ton 5 cwts. When the accumulation was cut away, the production of the furnace was not very much affected, yet an increased consumption of fuel was required. If the enlargement became too great, the furnace lost heat, fell off in yield, and could only be restored to economical working again by a process of filling up. Mr. J. S. Birkinbine, of Philadelphia, called attention to the fact that the change in shape from the old charcoal furnaces with high crucibles and flat boshes, and some of the new charcoal and coke furnaces was greater than the change noticeable between the latter and that proposed by Mr. Taylor. Mr. J. Hartman, of Philadelphia, and Dr. Raymond spoke on the subject of scaffolding. The Secretary then a paper by Richard E. Chism, on

THE VALLECILLO MINES,

which he believes are the only paying ones in American hands in Northeastern Mexico, including the States of Nuevo Leon, Coahuila, and Tamaulipas. Their authentic history dates from their ownership by an American company in the year 1851, when they were bought by the Vallecillo Silver Mining Company, of New York.

The mines are in the northern part of the State of Nuevo Leon, about thirty-five miles north of east from the Vallaldama station of the Mexican National Railroad.

The main Vallecillo vein is a true fissure, which cuts the limestone strata with a strike of north 40 degrees, and dips 56 degrees to the northwest. It has an average thickness of about one yard, having a pay-streak of from one to eighteen inches. The structure is irregularly banded, although the upper part is so decomposed that this can not be easily seen. In sinking on the vein, fresh water is met with at a short distance from the surface and down to 150 feet. From that point, the water is salt, and is met with in large quantities. The minerals found are argentiferous galena, zincblende, and copper and iron pyrites, the latter in small quantity; the gangue being calc-spar, feldspar, and some fluorspar. As the work progresses, curious alternations are observed in the amount of zincblende and galena. This last is present at some points in large bodies nearly pure. These bodies begin to taper off in every direction to an edge, and a body of zincblende appears alongside, growing as the body of galena diminishes, with a layer of a mixture of the two minerals between. Then the blende, in its turn, diminishes, and the galena increases in quantity. Near the surface, the sulphides are changed to carbonates of the two metals, and these are at present left standing, being unsuited to the process now in use for the extraction of the lead.

After describing the workings of the mine, Mr. Chism computes the reserves at 510,000 square feet of the vein; and judging from the fact that 320,000 square feet extracted yielded 200,000 pigs of lead weighing 62·5 pounds each, he places the present reserve in sight at 200,000 pigs.

The mine requires a good deal of timbering. Drifting is contracted for at from $22 to $30 Mexican per yard, which gives the miners about $1.25 a day. For stoping, the prices range from $4 to $6 a yard in length and hight, full width of vein, the miners doing the sorting and delivering the ore to the shaft. The water is handled by a ten-inch Cornish pump and a smaller one that catches the fresh surface water and delivers it to surface for boiler feeding. The main pump-engine is horizontal, 18 by 36 inches, with a ten-ton fly-wheel, and is geared to the pump at the rate of five to one. The hoisting is done with a double Lidgerwood, run by a Mexican boy. Steam is supplied by two 70 horse-power boilers, with a 70 horse-power Babcock & Wilcox in reserve. The water for the boilers passes through a feed-water heater, and the exhaust steam goes through a condenser. Two Knowles pumps are used for auxiliary purposes. Mr. Chism goes on to describe the very crude methods of concentrating employed. The following paragraph is suggestive of the peculiar way in which the mine is run: As neither the total amount of material raised nor the cleaned ore is ever weighed at this mine, it is almost impossible to estimate closely the proportion of cleaned ore to total output. In May, 1884, they were raising some 50 tons of material a day, from which about 10 tons of ore were cleaned up. This ore contains about 72 per cent of pure lead, and has from 25 to 48 ounces of silver per ton. No assays are made now, nor have been made for several years, so that this estimate is more or less guess-work, founded on back calculation from the market returns of the lead bullion.

The ore is worked in three hearths, according to the Joplin method, Mr. Chism describing the operations in detail. Each hearth is attended by two men and a boy, who must produce 35 pigs of 62·5 pounds each, from 3500 pounds of ore. The superintendent estimates the cost of smelting each 35 pigs at $6, subdivided as follows:

Two smelters at $1	$2.00
One boy	.25
One load wood (half a cord)	1.25
Part cost of power	1.50
Part cost of lead smelter	1.00
	$6.00

On the question of productive values and profits, Mr. Chism says: At the time of my visit, there were three hearths running and turning out 105 pigs a day. A considerable reserve of ore was accumulating, as the consumption was less than half the daily product, which would have sufficed for six hearths. With six hearths, the production should be 210 pigs a day. The returns from Liverpool give, as I am informed, the silver value of the bullion as from 58 to 75 ounces a ton of 2240 pounds. Allowing an average value of 65 ounces a ton of 2000 pounds, of which only 45 ounces are paid for by the smelters, and pricing the lead at 3 cents a pound, we have the following as the market value of the daily product, if six hearths were in operation:

13 125 pounds of lead at 3c.	$393.75
6½ tons lead give 292·5 ounces silver, paid for at $1 an ounce	292.50
	$657.00

From these returns must be deducted the cost of mining, concentrating, smelting, and marketing, which Mr. Chism estimates approximately:

General Staff.	
Superintendent ($15), bookkeeper ($3), machinist ($4), helper ($1), blacksmith ($1)	$24.00
Mining.	
Underground captain ($4), assistant ($2.50), 2 pump-engineers (at $1), 4 firemen and helpers (at 75c.), 2 hoist boys (at 30c.), 6 surface men (at 75c.), 50 miners (at $1.25)	79.10
Materials.	
7 loads of wood for pumping ($8.40), oil and packing ($3.50), powder and fuse ($5), hammers, steel and charcoal ($3), candles ($5), wear and tear of machinery, $21,000 in five years ($11.75), timber, prospecting, and dead-work ($20)	56.65
Total mining	$135.75
Concentration.	
1 jig boss ($1), 4 ore-washers (75c.), 8 jiggers (25c.), 6 carriers (75c.), 4 loads of wood (at $1.20), oil packing ($2), tools, barrows, etc. ($2.50), dumping waste, ($8), wear and tear of machinery, $3000 in five years ($1.70)	29.50
Smelting.	
Labor ($36), wear and tear of plant ($2 25)	38.25
Total for mining, smelting, and concentrating and general staff	$227.50

equal to $193.37 U. S. currency. Adding $130 for freight on 6½ tons to Liverpool, and $24 for commissions, Mr. Chism reaches a total of $347 37 U. S. currency. Allowing twenty per cent interest on $100,000, anounced to be the capital invested in mine, plant, reserves, and rights, Mr. Chism adds $55 interest a day, and thus reaches $402.37 as the true total daily expense of mine and works. Subtracting this from the daily market returns, figured at $657, he gets $254.63 as the net daily profits on a production of 200 pigs a day, equivalent to $7600 a month.

In the discussion, Mr. C. Kirchhoff, Jr., pointed out that Mr. Chism had assumed 3 cents as the price obtainable for the lead. Since it can be marketed only in England, it will not fetch more there than an equivalent of 2·4 cents a pound, which makes a very considerable difference in the estimated daily product. Mr. Kirchhoff, furthermore, did not believe that it would be possible to establish a zinc industry in Northern Mexico, in the absence of a local market and with the tariff barring Mexican metal out of the United States.

Mr. Oswald J. Heinrich, of Drifton, Pa., made some remarks on

THE PROSPECTS OF THE AMMONIA SODA PROCESS.

Referring to the extract from Mr. Walter Weldon's address, published in a recent issue of the ENGINEERING AND MINING JOURNAL, Mr. Heinrich dwelt upon the rapid growth of the ammonia soda industry, giving the following interesting table of statistics of the production of soda by the two different processes in the following countries:

Country.	By ammonia soda process. Tons.	By Leblanc process. Tons.	Total. Tons.
Great Britain	52,000	380,000	432,000
France	57.125	70,000	127,125
Germany	44,000	22,500	56,500
Austria	1 000	39,000	40,000
Belgium	80 000	.....	80,000
United States	1,100	.....	1,100
Total	235,225	511,500	736,725

A letter was then read from Mrs. Mary Holley, acknowledging the receipt of the Holley Memorial Volume.

The following papers were read by title: The Patience of Copper and Silver as Affected by Annealing, H. M. Howe, Boston, Mass.; The Separation of Strata in Folding, Frederick G. Bulkley, Leadville, Colo.; The Electrical History of Ore-Bodies, Carl Barus, New Haven, Conn.; Geology and Mineral Resources of the Rio Grande Region in Texas and Mexico, E. J. Schmitz, New York; Iron Ores of Putnam County, New York, Arthur Wendt, New York; Basic Refractory Materials, Prof. T. Egleston, New York; The Determination of Phosphorus, Joseph Westesson, Thurlow, Pa.; American Mining Machinery in Mexico and Central America, F. H. McDowell, New York; Notes on the Durham Blast-Furnace, B. F. Fackenthal, Jr., Reigelsville, Pa.; The New Mining Laboratory of the Massachusetts Institute of Technology, Prof. R. H. Richards, Boston, Mass.

After the offering by Mr. W. F. Durfee of a resolution thanking the various corporations, the committees and others, who had exerted themselves in behalf of the visiting members, the meeting adjourned. At eight P.M., a large proportion of the members attended the general session of the American Association in the Academy of Music, and the reception given by the citizens of Philadelphia to the members of the scientific societies and their families.

On Saturday, the Institute, with a contingent from the American

Association, visited the anthracite region. The party numbered nearly 500, and but for the excellent management of Mr. C. A. Ashburner, who was in charge, would have been difficult to handle. Transportation was furnished by the Reading Railroad Company and the Lehigh Valley Railroad Company, and the round trip consumed sixteen hours. At eight o'clock in the morning, the train, consisting of twelve cars, left the Broad and Callowhill streets depot. The route was by way of Pottstown, Reading, Port Clinton, Mount Carbon, Frackville, and Mauch Chunk, thence through Allentown and Bethlehem back to Philadelphia. At Palo Alto, the excursion was joined by a special train from Pottsville, bringing a party of forty guests.

At Newcastle, foot of Broad Mountain, the train was divided into three sections, and slowly they climbed the hights. At the top of the mountain, a lunch was served by a citizens' local committee. This disposed of, the excursionists were sent down the Mahanoy Plane, one car descending at a time.

From there, the party proceeded to the Indian Ridge colliery of the Philadelphia & Reading Coal and Iron Company, at Shenandoah. The shaft of this colliery is sunk to the Mammoth seam, and is 310 feet in depth. A breast, about 30 feet wide, 20 feet high, and 120 feet long, pitching at an angle of about 15 or 20 degrees, was selected as the train that had brought them to Lansford. It was a delightful excursion, and was full of surprises for the English visitors. Mr. C. A. Ashburner, of the Pennsylvania Geological Survey, prepared and printed an instructive pamphlet on the anthracite coal-fields and the operations conducted in mining. This was distributed to the excursionists.

particular point to be visited. It is located on the east gangway of the north dip, about 500 feet east of the shaft. The Mammoth seam at this point is in the neighborhood of 50 feet in thickness, although the full thickness of the seam could not be seen, as a large portion of the top coal was left unwrought. The interior of the large opening in this immense body of coal was brilliantly lighted with six arc lights, through the kindness and under the personal supervision of Mr. R. W. Kear, of the Arnoux Electric Light Company, Pottsville, Pa. The electrical plant was placed immediately behind the large steam-pumps aside of the shaft, from which the wires were conducted through a traveling way around the shaft, out through the gangway and along each side of the breast to be visited. An electric light was also placed near the engine, making seven lights altogether. The roads and gutters were cleaned; the former strewn with ashes; large lamps with reflectors were hung on the side of the gangway at intervals of 15 or 20 yards, and temporary rails were placed on each side of the track to protect visitors from accidentally coming against the side of the gangway.

From the Indian Ridge pit, the party was conveyed to Lansford, and there transferred to gondolas and taken on the mining tracks of the Lehigh Valley Railroad to the top of Summit Hill. These tracks have a very heavy grade, and are never used for passenger traffic. It was considered a great piece of luck to be able to travel on them, as the view along the route is magnificent. From Summit Hill, the party went down the Switchback, a complimentary trip tendered to them by H. J. Munford. At Mauch Chunk, supper was provided at the Mansion House and American Hotel by the Philadelphia local committees.

At seven P.M., the party was returned to Philadelphia by the special

THE HOFFMANN OVEN FOR THE RECOVERY OF BY-PRODUCTS IN COKING

Dr. Otto, of Dahlhausen, whose name is frequently coupled with the coking-oven for the recovery of by-products, read, at the last meeting of the German Society of Iron-Masters, a paper on the results obtained, and we notice that he is announced to present a communication on the same subject at the Chester meeting of the Iron and Steel Institute now in progress. The oven was invented by Gustav Hoffmann, of New-Laessig, near Gottesberg, the chief feature of the design being a combination of the Siemens regenerator with the ordinary coke-oven. The ovens were first built in an experimental way at the works of the Silesia Coal and Coke Company, without condensing apparatus for the gas, followed by a complete plant of 20 ovens at the Pluto Colliery, near Wanne, and a plant of 20 ovens at the works of the Silesia Coal and Coke Company, at Gottesberg. The results of these plants have been so favorable that there are now 120 coke-ovens, with complete condensing plant, in course of construction at different points in Germany.

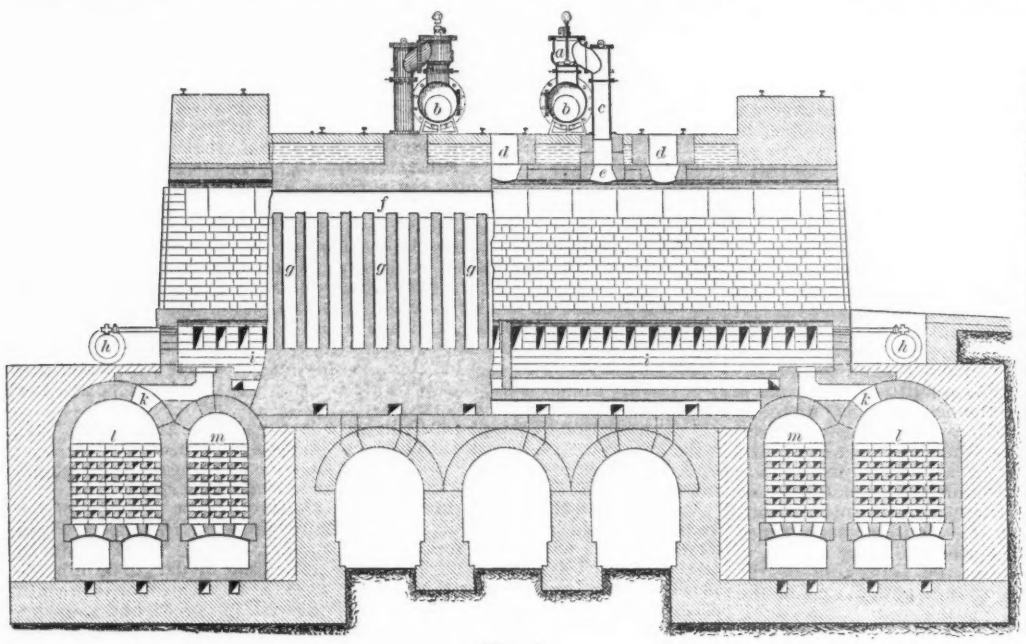

Fig. 1.

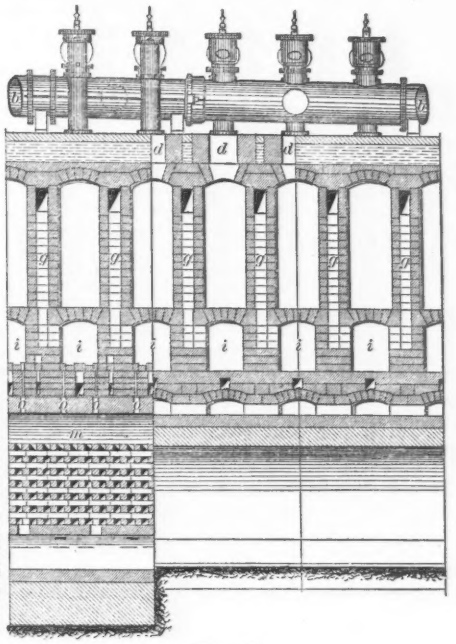

Fig. 2.

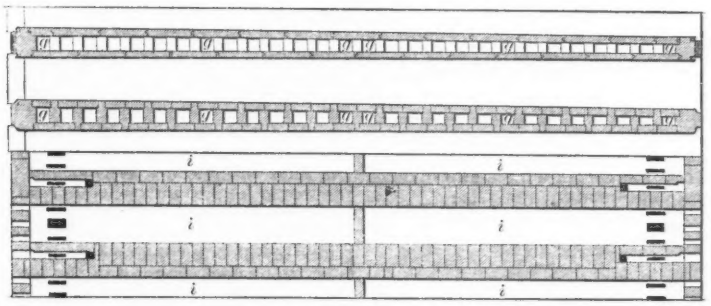

Fig. 3.

THE HOFFMAN COKING-OVENN AT THE PLUTO COLLIERY.

From the accompanying drawings, it will be seen that the plant at the Pluto Colliery is a combination of Siemens regenerators with ovens possessing vertical flues in the side-walls. The dimensions of the ovens are those common with 9-meter ovens in Westphalia, a width of 600 millimeters, a hight of 1600 millimeters to the spring of the arch, and the distance from center to center 950 millimeters. The principal points of difference between them and ordinary ovens are the following: In the latter, there are openings in the coking-chamber, from which the gases escape first into flues in the side-walls, and then into flues in the bottom, where they are burnt with the aid of air brought into contact with them, with the object of heating the coking-chamber sufficiently to carry on the coking process. In the Hoffmann ovens, there is direct connection between coking-chamber and flues. Besides the discharging and the charging-doors *d*, closed during the working, the oven has only two apertures *e*, in the arch, from which the gases evolved during the coking process escape. A horizontal flue *f* connects the upper parts of all the vertical flues *g* in the wall. Every bottom flue is divided by a vertical wall, shown in Figs. 1 and 3, into two equal parts *i i*, each of which is connected with two regenerators placed side by side *m m*, being used to heat the gas, while *l l* are reserved for heating the air used for the combustion of the heating gas. The regenerators are long flues filled with checker-work, in order to get a large surface. They pass along the whole group of ovens, and at the end the two air regenerators *l l* may be connected by a valve with the air-pipe or the stack, and a similar arrange-

ment is provided for the gas regenerators. When the ovens are charged, heated, and working, the gas from the coal undergoing the coking process escapes through the opening *e*, into the pipe *c*, and then into the pipe *b*. The valve *a* makes it possible to cut off the connection between the oven and the condensing plant at will. The gas escaping from the oven is cooled in condensers and washed in scrubbers, through which tar and ammonia are collected. After the gases have passed the condensers and scrubbers, they are forced by the exhaust-fan that has drawn them from the oven to the condenser back to the oven to either of the two gas regenerators *m*, according to the position of the valve. The air, which is forced in by a fan, enters the corresponding air regenerator. Both of the regenerators are connected by apertures *o* and *k* with the bottom flue, the combustion of the gas partly taking place in the latter. The entire current of burning gases enters into the vertical flues *g*, flows into the horizontal connecting flue *f*, and passing downward into the vertical flues *g* of the other half of the length of the oven, returns through the other half of the bottom flue through *o* and *k* into the other two regenerators, which they heat on their way to the chimney.

This was the original plant at the Pluto Colliery; but it has been since so modified that only the air is heated in the regenerators, because there is danger of leakage between the long parallel gas and air regenerators, which might lead to destruction of the masonry, and because every change of the reversing-valve causes the loss of the entire quantity of gas filling the regenerator. Besides, the volume of the air needed to run the gas is six times as great as the latter, and it seemed simpler and more important to heat the large volume of air to a high temperature than to attempt to heat the small volume of gas. Both of the regenerators are therefore now used at the Pluto Colliery for heating air, which reaches a temperature of 1000 degrees Celsius. It is possible, by employing air so highly heated for the combustion of the gas, to get along with only a part of the gas coming from the condensing plant after the tar and ammonia have been condensed, in spite of the fact that in reality the calorific power of that gas is comparatively low. It has been found that the excess of gas generated in coking over that really required to furnish the heat for the coking process is about 100 cubic meters per day per oven. The temperature in the bottom flues and the walls is so high that, with ordinary charges of 115 cwts. of dry coal, the coking takes forty-eight hours, and often less. If the coking proceeds too rapidly, all that is necessary is to cut off a part of the gas supply, and thus reduce the temperature. The process is under complete control, because both gas and air are blown in, and the quantities of both may be accurately regulated. The quality of the coke is excellent. At the Pluto Colliery, the yield of the new ovens is greater by seven per cent than in the old ones, being 61 and 68 per cent respectively, allowing 10 per cent for moisture in the coal, and from 67·7 to 75·56 per cent respectively referred to dry coal. This greater yield may be easily explained by the thorough manner in which the air is excluded. Measurements made with a Steinle & Hartung graphite pyrometer showed that the temperature in the bottom flue ranged between 1200 and 1400 degrees Celsius, in the side-walls from 1100 to 1200 degrees, in the regenerator 1000 degrees at the beginning of the admission of air and 720 degrees at the close of that period, and in the stack 420 degrees Celsius.

At the Pluto Colliery, the ammonia water is not worked for sulphate of ammonia, but is sold as such. The yield of ammonia, computed as sulphate of ammonia, is about one per cent of the weight of the dry coal. The average of the best month at the Pluto Colliery showed a yield of tar of 3·46 per cent, while the poorest month averaged 2·78 per cent of the weight of the dry coal. These fluctuations were due principally to the fact that the supply of water for the condensers was not always sufficient. The quantity needed per day is 5 cubic meters per oven. According to an examination made by Dr. Knublauch, of Ehrenfeld, near Cologne, the tar, free from water, contained from 0·954 to 1·06 per cent of benzine, from 4·27 to 5 27 per cent of naphthaline, from 0·575 to 0·64 per cent of anthracene, and about 50 per cent of pitch. The gas, of which, as remarked, a portion is available for other purposes, contained by analysis:

Benzine	0·60	per cent, by volume.
Ethylene	1·61	"
Sulphureted hydrogen	0·42	"
Carbonic acid	1 39	"
Carbonic oxide	6 41	"
Hydrogen	52·69	"
Methyl (CH_4)	35·67	"
Water	1·21	"
	100·00	

This gas has about one half of the illuminating power of good illuminating gas. Dr. Otto estimates that the cost of plant is equal to about three or four times the cost of ovens without condensing arrangements, so that while the condensation of the by-products pays, the large capital required is likely to prevent any sudden rush into this new industry.

THE COATING OF HYDRAULIC RAMS WITH COPPER.—The Broughton Copper Company (Limited) has now on view at its works, Broughton Road, Salford, two exceedingly large hydraulic rams, which it has succeeded in covering with a copper tube in which there is not a single joint. The rams are 27 feet long and 10 inches in diameter, and have been made for the Victoria Graving-Dock Company, London. This company has in use thirty-two rams, and has hitherto experienced great difficulty on account of the corrosion of the cast-iron rams that it now uses for hydraulic lifts. For some time, it has been found possible to cover small rams with copper, but attempts to cover very large rams with the same metal have generally failed. This has arisen from the fact that the outside copper tube has usually been constructed in sections or lengths, which it was found impossible to join so closely as to prevent the water from getting through. The difficulty has been got over by the Broughton Copper Company by the construction of a tube one eighth of an inch in thickness, of the same length as the ram. This tube has been fitted with the greatest nicety around the ram, and, being without a single joint or opening, it seems impossible for water, in however small a quantity, to get to the iron ram inside. The longest copper tube exhibited at the Paris Exhibition was 25 feet in length. The tubes just manufactured by the Broughton Copper Company are two feet longer, and are, therefore, among the largest ever produced.

THE LAW OF THE APEX.*

By Rossiter W. Raymond, New York City.

(*Concluded from page* 194.)

In the Dives-Pelican and other important cases, Judge Hallett took a similar view. And the whole matter was finally settled by the United States Supreme Court in the Flagstaff case (8 Otto, 463), already cited, from which decision I now quote further:

"Both parties agree that the owner of a mining right in a lode or vein can not follow the course of the vein beyond the end-lines of his location extended perpendicularly downward; but that he may follow the dip to an indefinite distance outside of his side-lines. This is undoubtedly the general rule of miner's law, and the true construction of the act of Congress. The language of the act of 1866 (14 Stat., 251) in relation to a 'vein or lode' is, that no 'location hereafter made shall exceed two hundred feet in length *along the vein* for each locator, with an additional claim for discovery to the discoverer of the lode, with the right to follow such vein *to any depth*, with *all its dips, variations, and angles*, together with a reasonable quantity of surface for the convenient working of the same as fixed by the local rules, etc." The act of 1872 is more explicit in its terms, but the intent is undoubtedly the same as it respects end-lines and side-lines and the right to follow the dip outside of the latter. We think that the intent of both statutes is, that mining locations on lodes or veins shall be made thereon lengthwise, in the general direction of such veins or lodes on the surface of the earth where they are discoverable; and that the end-lines are to cross the lode and extend perpendicularly downward and to be continued in their own direction either way horizontally; and that the right to follow the dip outside of the side-lines is based on the hypothesis that the direction of these lines corresponds substantially with the course of the lode or vein at its apex on or near the surface. It was not the intent of the law to allow a person to make his location crosswise of a vein so that the side-lines shall cross it and thereby give him the right to follow the strike of the vein outside of his side-lines. That would subvert the whole system sought to be established by the law. If he does locate his claim in that way, his rights must be subordinated to the rights of those who have properly located on the lode. Their right to follow the dip outside of their side-lines can not be interfered with by him. His right to the lode only extends to so much of the lode as his claim covers. If he has located crosswise of the lode, and his claim is only one hundred feet wide, that one hundred feet is all he has a right to. This we consider to be the law as to locations on lodes or veins.

"The location of the plaintiffs in error is thus laid, across the Titus lode, that is to say, across the course of its apex at or near the surface; and the side-lines of their location are really the end-lines of their claim, considering the direction or course of the lode at the surface.

"As the law stands, we think that the right to follow the dip of the vein is bounded by the end-lines of the claim properly so-called; which lines are those which are crosswise of the general course of the vein on the surface. The Spanish mining law confined the owner of a mine to perpendicular lines on every side; but gave him greater or less width according to the dip of the vein. (See Rockwell, pp. 56–58, and see same book, pp. 274, 275.) But our laws have attempted to establish a rule by which each claim shall be so many feet of the vein, lengthwise of its course, to any depth below the surface, laterally, its inclination shall carry it ever so far from a perpendicular. This rule the court below strove to carry out, and all its rulings seem to have been in accordance with it.

"The plaintiff in error contended, and requested the court to charge in effect, that having received a patent for 2600 feet in length and 100 feet in breadth, commencing at the Flagstaff discovery, on the lode at the surface, they were entitled to 2600 feet of that lode, along its length, although it diverged from the location of their claim, and went off in another direction. We can not think that this is the intent of the law. It would lead to inextricable confusion. Other locations correctly laid upon the lode, and coming up to that of the plaintiff in error on either side, would, by such a rule, be subverted and swept away. Slight deviations of the outcropping lode from the location of the claim would probably not affect the right of the locator to appropriate the continuous vein; but if it should make a material departure from his location, and run off in a different direction, and not return to it, it certainly could not be said that the location was on that lode or vein farther than it continued substantially to correspond with it. Of what use would a location be, for any purpose of defining the rights of parties, if it could be thus made to cover a lode or vein which runs entirely away from it? Though it should happen that the locator, by sinking shafts to a considerable depth, might strike the same vein on its subterranean descent, he ought not to interfere with those who, having properly located along the vein, are pursuing their right to follow the dip in a regular way. So far as he can work upon it, and not interfere with their right, he might probably do so; but no farther. And this consequence would follow irrespective of the priority of the locations. It would depend on the question as to what part of the vein the respective locations properly cover and appropriate."

It will be remembered that the paragraph previously quoted from this decision declares that not the true (horizontal) course of the vein but that which is indicated by surface outcrop or surface workings, whether level or inclined, is to be followed by the claim. To illustrate: A lode strikes due east and west and dips 45 degrees south. So long as the outcrop is followed by a level, its course is the true strike. But if, in going eastward, the ground falls away, the course of the outcrop changes from east toward southeast, though the true strike of the lode has not changed. According to the Flagstaff decision, a location on this part of the lode should include the outcrop and run southeasterly. This rule and the rule that when the side-lines cross the apex, "they are really the end-lines," are not easily reconciled with the declaration of the court that the rights of a cross-locator, irrespective of priority, are subordinate to those of proper locators, and that the latter rights are, "to follow the dip in a regular way." This matter will be more clearly appreciated after a study of Fig. 3, which is taken, with considerable modification, from a diagram furnished by Chief-Justice Beatty, of Nevada, to the Public Lands

* Read at the Troy Meeting of the American Institute of Mining Engineers, October, 1883.

Commission (*Report*, p. 403). This figure represents the apex of a lode, *ACEBD*, dipping as shown by arrows in the rectangles *C* and *D*. At *x*, *y*, and *z*, there are croppings upon the surface. The lode is supposed to be perfectly uniform in strike and dip, the true strike being shown by the line *OP*, which is a horizontal line drawn in the lode. The variations in the course of the apex are due to the topography of the surface, the most violent of them (from *C* to *A*) being caused by a precipitous ravine that cuts through the vein, exposing an outcrop *z* in the face of the precipice, while on the other side of the ravine the outcrop *w* shows the continuation of the same vein unaltered in its true strike and dip.

Between the outcrops *x*, *y*, and *z*, to the left of *x*, and on both sides of *w*, the course of the apex has been determined by shafts and costeaning pits. Upon this lode, A, B, C, D, and E have made locations. A, discovering the outcrop *z*, in the ravine, before any other explorations, made the location *aaaa* ; B next made the location *bbbb*, upon *x* ; then C located *ccc* upon *y* ; after which, D, finding the apex with the shaft *s*, and E, finding it with the shaft *t*, made their locations respectively as shown. Now what are the rights of the parties?

Let it be observed that this case has been studiously freed from complications such as occur in most mining lawsuits. There is no controversy as to facts. There is no change of dip or strike, no fault, no indefiniteness of lode or walls, no dispute as to priority, no formal defect of title, no peculiar local regulation or custom. A and B, we will suppose, have patents. C, D, and E are indeed subject to reservations of rights of prior locators, covering portions of their claims ; but this is a common occurrence, and by no means invalidates the claims or hinders the obtaining of patents.

According to the views of Judge Beatty, already quoted, E, though locating after B and C (the case of A is not in Judge Beatty's diagram, and is not considered by him), is nevertheless the owner of all that section of the lode included between the lines *mq* and *cl*, indefinitely prolonged. He asserts that the claims of B and C do not include the top or apex of this section. According to this view, the lines *mq*, *mq*, *cl*, *gh*, *gh*, in the diagram, being the projections of lines drawn *on the true dip* downward from the end of each section of the apex claimed, are the true boundaries of the extra-lateral rights. This, and this only, would be "to follow the dip in a regular way," as the Flagstaff decision puts it. But it is difficult to reconcile this with the explicit declaration of the statute concerning end-lines. The statute does not prescribe any regular way of following the dip. Let us take, for instance, the case of A. He is the first man on the ground. He is, so to speak, an intending purchaser of mineral lands, come at the invitation of the government to look over the unoccupied territory, and decide what piece to buy. No third party is affected by his decision. The statute says to him, "Find a lode, locate a claim not exceeding such a size along the apex, and, having complied with certain forms and conditions, you shall own . . . all lodes, throughout their entire depth, the top or apex of which lies inside of such surface-lines, extending downward vertically, although they extend, in their course downward, outside the vertical side-lines. But your right of possession to such outside parts shall be confined to such portions thereof as lie between vertical planes drawn downward through the end-lines of your location."

"But how shall I draw my end-lines?" inquires A. "Parallel to each other," replies the statute. "Be sure you draw them across the apex," adds the Supreme Court.

"What is the apex?" he inquires further. The statute is silent ; but the Supreme Court says, "That may not always be easy to determine ; but one thing is certain. If you follow the outcrop, or the edge of the vein nearest the surface, whether level or inclined, you have got it."

Following these directions, A makes his location *aaaa*, and it is hard to say why he is not entitled to the section of the lode between the lines *af*, *af*, extended indefinitely. The statute does not hint, and the Flagstaff decision does not clearly imply, that end-lines actually crossing the apex can be objected to as boundaries for the extra-lateral right. Nor can B, C, D, and E complain. They have not yet arrived. When they do arrive, they must take what is left. Their rights, whatever they may be, will stop at the upper line *af*, and recommence at the lower line *af*. We have thus the remarkable proposition, that of the point *u* in the lode, A is the owner, by virtue of the apex in his claim, while, of the point *v*, directly below it on the dip, B is the owner, by virtue of the apex in his claim. And continuing down in the same line, a point would at last be reached, below all the rights of A, B, C, and belonging to E. This is an absurd result, and doubtless was not contemplated by the makers of the law. Yet how can it be avoided? There seems to be but one possible way. The courts may say to A "The extra-lateral right granted to you was based on the condition that the lode, in its course downward, extended outside your side-line. Now this course downward must be taken on the true dip. You can not follow the lode in the direction of your end-lines in this case, if you thereby interfere with other, even later, locators, who are following the dip in a regular way." If this be a permissible construction of the law, Judge Beatty's view would be sustained ; and A, who located, as he supposed, a length, *qq*, of the lode, would find his real length reduced to *hh*. And there would be other results. The uniform ruling of the courts as to end-lines would be overthrown, and the "iron-clad potency" of United States patents would be sadly impaired. Turning back, for instance, to Fig. 2, we may see that the location *bbbb* has end-lines obliquely crossing the apex. Thousands of mining claims have this form ; and the extra-lateral right, bounded by *bb'*, *bb'*, has been maintained in innumerable instances. To demand that this right shall follow the true dip would make the definition of the right difficult, in many cases, in the early stages of exploration. It might not be impracticable to require that the course of a lode should be horizontally determined, and that end-lines of locations should be drawn at right angles to this course, though there would be endless trouble from local variations in dip and strike. But the present question is, whether the statute does make such a requirement. Judging from universal practice under it, it does not. Miners have a special reason for drawing oblique end-lines. The valuable ore in our gold and silver lodes generally occurs in chutes or chimneys, which pitch obliquely in the lode ; and a skillful prospector endeavors to make his location so that he will have the right to follow not merely the lode, but the pay-chute in the lode, beyond his side-lines. To overrule this practice would be a policy both novel and questionable.

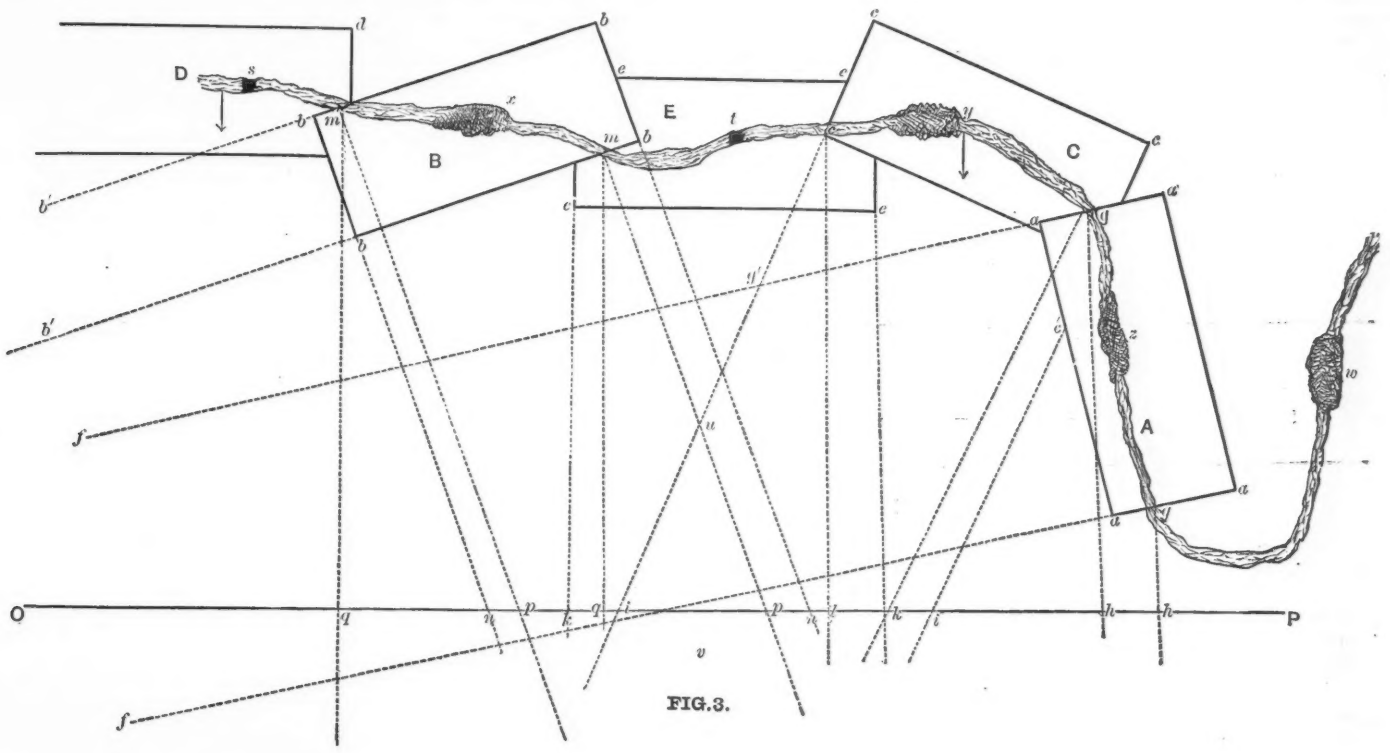

FIG. 3.

Returning to Fig. 3, then, we see that either construction of the law as applied to the case of A involves great difficulty. A case involving this principle is now on trial in Dakota before Judge Church.

The location of B, in this diagram, presents even greater perplexity. For the lode passes under the side-lines of B at *mm* ; and according to the Flagstaff decision, he can not claim the boundaries *bn*, *bn*. Either (1) in the words of that decision, "the side-lines of his location are really the end-lines of his claim"—in which case his extra-lateral boundaries are *bb'*, *bb'* (to the consternation of D !) ; or (2) the true end-lines of his claim are to be drawn through *m m*, parallel to the end-lines of his survey—which would give the boundaries *mp*, *mp* ; or (3) the new end lines are to be drawn on the true dip, in which case we have *mq*, *mq*. In the first case, the triangular space *qmb'* is left unappropriated and without an apex, unless the claim of A takes part of it ; and E will have the triangle inclosed between *ek* and *ci*. In the second case, the claim of E is practically reduced to the triangle *muc* ; and in the third case, E will have the triangle inclosed between *mq* and *ci'* continued till they intersect—subject, in both cases, to the possibly superior claims of A. And in all cases, E will, at some depth, come into his full right to the distance *ql* along the lode. It may even be that E, at a depth below the lines *mp*, *gk*, or *ci* and *af* (produced to cross his ground), that is to

say, below the ground covered by the claims of either or all of A, B, and C, may rightfully own the length *kk* of the lode. For, it will be noted, the lode does not leave his location at *m* and *c;* his location is simply overlapped by B and C ; and where their subterranean rights end, it is conceivable that his may begin again.

The same is true of the location of C. If the extra-lateral rights of A are bounded by *af*, *af*, then C is confined to the triangular space *gycg'*; but below the lower line *af*, he might recover his full right to the distance *ii* on the lode (that is, if it were not for the prior claim of B, which, however, at a greater depth, would likewise get out of his way). This distance *ii*, by the way, covers a length upon the lode greater than that of C's surface claim.

This discussion might be indefinitely prolonged by introducing into the problem such irregularities of the vein formation as perplex experts, lawyers, judges, and juries in nearly all mining suits. But it is sufficient to show what difficulties beset cases that might be considered exceptionally simple.

A further complication of the end-line question remains, however, to be considered. The act of 1872 makes no explicit distinction, as to the extra-lateral right, between the lode first discovered and used as a basis for the location and other lodes cropping or topping in the same location. It seems to have imagined that these lodes would all be parallel to the first discovered, and that the same end-lines would do for them all. This is, indeed, the view taken by Judge Elbert in Paterson *vs.* Hitchcock (Bull of the Woods-American case, 3 Colorado, 533) from the abstract of whose decision in Carpenter's *Mining Code* (3d ed., p. 61) I quote the following extract :

"Under this act [1866], the right to surface ground was clearly dependent upon the right to the lode located. It failing, all incidents thereto attaching would necessarily fail. Although the act of 1872 enlarges the rights of the locator by a grant of all the veins, lodes, and ledges the top or apex of which lies within his surface-lines, we are still of the opinion that his right to the surface ground continues dependent upon his right to the principal lode, and that his right to other lodes within his surface limits is equally dependent. This enlargement of the right of the locator

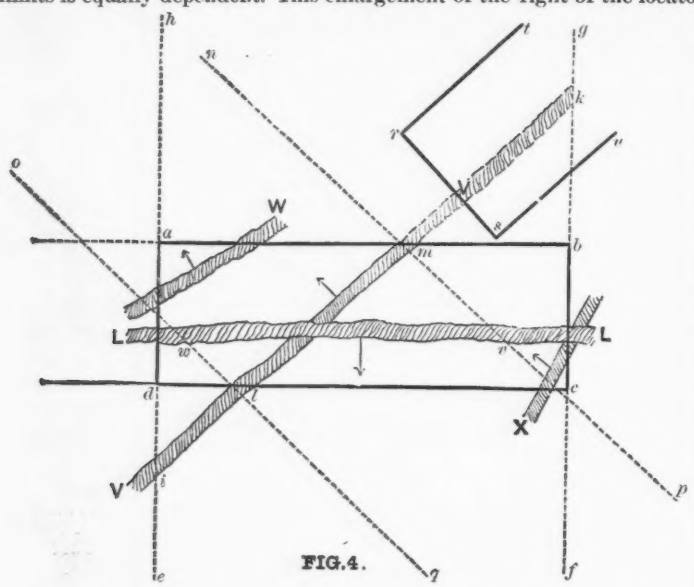

FIG. 4.

was doubtless intended to stimulate his enterprise by increasing his reward; but the controlling reason was to prevent the controversies which were constantly arising respecting veins or lodes connected or associated with the lode claimed. These controversies abstracted from the full and proper enjoyment of the principal lode granted, and the design was to settle and prevent them. In this, and in the case of surface ground, it was intended to grant that which was associated with the principal lode by proximity, within prescribed limits. When this association ceases in the case of surface ground, the reason for granting it ceases. A mineral vein or lode is a leading term in both acts. There must be a lode discovered and appropriated by compliance with the requisites of location.

"This is the prominent and pronounced subject of the grant. This is what the miner has discovered and claimed by right of discovery. The security of his title thereto was the practical necessity with which the act dealt; all else, we think, incident thereto ; under the act of 1866, the right to the surface ground—under the act of 1872, both the right to the surface ground and the right to other veins, lodes, and ledges. The principal lode constitutes the measure of the miner's right to the surface ground, *as the surface ground, when thus determined, in turn constitutes the measure of his right to other veins, lodes, and ledges*, subject to the express limitations of the law. It follows, therefore, that, if the lode located terminates at any point within the location or departs at any point from the side-lines, the location beyond such point, and to that extent, is defeasible, if not void."

I have italicized the most important clause in this opinion. The main point aimed at by the court is the "side-line question" (subsequently settled in the Flagstaff case); but incidentally the application of the end-lines to the "other lodes" is defined.

Fig. 4 illustrates the effect of this ruling. Upon the lode *LL*, dipping as shown by the arrow, the location *abcd* has been properly made. It covers the apex throughout, and the end-lines are at right angles to the true as well as the apparent course of the lode. There can be no doubt, therefore, that the locator owns this lode beyond the side-line *cd*, between the boundaries *de* and *cf*. A second lode *V*, not discovered at the time of location, crosses the lode *L*, with the dip shown by the arrow. What are the rights of the locator of *L* upon this lode *V*? According to Judge Elbert's ruling, the lines *eh* and *fg*, projections of the vertical planes through the end-lines of the *L* location, represent the boundaries of the extra-lateral right on *V*. That is to say, the locator, whose surface includes only the length *lm* of this vein, will own the length *ik* upon it at all depths—even though a subsequent locator should have made the location *trsu* upon *V* as the main lode. Nay, we may even assume that the existence of *V* was not known until it was discovered and located in *trsu*, and that thereupon the prior locator of *L*, finding that the new vein ran through his ground, stretched out his end-lines after it. If the above ruling is correct, the locator of *L* would get *V* as far as *k*. And this seems to be the best construction of the law. For if it should be held that the locator could own only so much of *V* as his surface contains of its apex, then *mn*, *lo* would be his boundaries, and we should have two entirely distinct sets of boundaries under one location. I forbear to discuss the aggravations which would be effected by the further discovery of the lodes *W* and *X*, each of which crosses one of the *L* end-lines.

If, on the other hand, the vein *V* had been the one located and *L* had afterward been discovered within the claim, then *mn*, *lo* (or, on another theory, *ma*, *ld*) would be the boundaries of the *V*-claim underground, and *mp*, *vq* those of the *L*-claim. That is to say, this would be the case according to one solution of the problem considered in connection with B's claim, Fig. 3. Whoever is fond of permutations and combinations may find amusement in combining the conditions of Figs. 3 and 4 indefinitely. I will suggest but one further example :

In Fig. 3, let us suppose that other locations are made beyond A, from *g* to *w*, etc., following the curve caused by the ravine in the outcrop. The decision as to the rights of such locations is not easy, however their end-lines be drawn. It is now pending in the United States Supreme Court in the case of the Iron Silver Mining Company *vs.* the Elgin Mining Company (Stone-Gilt Edge case). The court in Colorado has decided that claims located on the sides of such a bend, following as they do more nearly the dip than the strike of the lode, get no extra-lateral rights at all. The Supreme Court, if it overrules this, will have to decide what are the rights of such locators—and this will settle the problem of A, Fig. 3.

There are many other sources of doubt and difficulty in the United States mining law. Even the four topics of the lode, the apex, the downward course, and the end-lines have not been exhausted in the present paper. But I trust enough has been said to show that the law of the apex is no great improvement on the old law of the discoverer, and that the law of the surface-owner—or the so-called "square location"—if it could only be made acceptable to our mining districts, would deliver the industry from much trouble and expense. Failing that, we must simply look to the courts for a gradual settlement, though it be arbitrary and questionable *per se*, of the embarrassing questions that surround the subject. Any decision would be better than the present confusion.

It remains only to mention a very important decision, rendered June 18th, 1883, by which the meaning of the terms "known lode," in section 2333 of the Revised Statutes, has been determined. The case was that of the Iron Silver Mining Company *vs.* Sullivan *et al.* The section referred to (already quoted in this paper) provides for the reservation from any placer patent of a known lode within the placer survey; but declares that "when the existence of a vein or lode is not known, a patent for the placer claim shall convey all valuable mineral and other deposits within the boundaries thereof." It must also be remembered that section 2329 includes under "placers" all forms of deposit excepting veins of quartz or other rock in place.

In the case referred to, the plaintiff brought suit against parties working lode-claims upon its patented placer ground A clause in the placer patent excepts from the grant thereof all lodes known to exist within the claim at the date of the application. The defendants claimed that their lode was so known to exist, by reason of developments made in neighboring claims ; but it was conceded that no location had been made upon it, within the placer claim, before the application for placer patent.

Upon these pleadings, Judge McCrary held, in the United States Court at Denver, that the terms "known" to exist, and equivalent phrases in section 2333, mean a claim duly located or recorded and owned by a third party before the placer claimant applied to the government for a patent. The mere existence of a lode by geological inference, or by general rumor and belief, will not suffice. It must be actually known by discovery, and legal proceedings (at least, to the extent of record) based thereon.

This decision is said to have been appealed to the Supreme Court. It is difficult to see how it can be set aside. If sustained, it opens a curious suggestion to miners. Under it, it will be only necessary for a prospector who has discovered ore in an unoccupied locality, to avoid carefully such developments as would demonstrate the existence of a lode in place, and to make prompt application for a placer patent; after which application he may proceed to find as many lodes as he can : they will all belong to him, and he will have 160 acres, instead of about 20, as his maximum surface area, and will pay $2.50, instead of $5, per acre. Extra-lateral rights he will have none ; but in view of the large area granted, he can afford to go without them. It appears, therefore, that, even under the present law, valid "square locations" can be made covering lodes ; and that they will be of greater size than would probably be granted by an explicit and intentional "square location" law. This is only one more instance of the way in which our present statutes may operate to bring about results not contemplated by Congress ; and it constitutes an additional reason for the authoritative construction of the law by the Supreme Court, or its radical reconstruction at the hands of Congress.

THE HEAT-CONDUCTING POWER OF MATERIALS.—Mr. J. J, Coleman has made some experiments on the heat-conducting power of different materials. He has communicated the results to the Philosophical Society of Glasgow, summarizing them in the following table, which shows silicate cotton or "slag-wool," pound for pound, to be the most efficient among those tested :

Silicate cotton	100	Charcoal	140
Hair felt	117	Sawdust	153
Cotton wool	122	Gas-works breeze	230
Sheep's wool	136	Wood and air space	280
Infusorial earth	136		

GLADSTONE, COLORADO.

Correspondence of the Engineering and Mining Journal.

In my last letter, I wrote encouragingly of the prospects of this camp. It is on the waters of Cement Creek, and may be regarded as a corner of the Red Mountain country. Two huge lumps of ore lie near the road about a mile up Cement Creek from Gladstone. These mineral boulders are the first things that Gladstone citizens point out to strangers. It is said that there is a standing reward by some one, somewhere, of $50,000 for the discovery of the lode whence these boulders came; hence search, long and earnest, has been made, but as yet the secret has not been made an open letter. One theory is, that they are from the opposite side of the gulch and from a long distance up the mountains, and were brought to their present position by a snow-slide; but there is no ore like that of which they are composed on the side opposite them. The most natural inference is, that they rolled down from the hill at whose base they so quietly lie. The probability is, that their source, now covered by "slide" dirt, is not far up the mountain, and which, when found, will prove to be a large vein of low-grade ore, they having once formed part of the gossan of the vein. By general consent of the camp, these boulders are to remain where they are as a sort of advertising pointer to future prosperity. The movement that ousted them from their bedding is regarded as an effort of nature to start an exhibition for the benefit of the mining industry of Cement Creek. The "specimen fiend," however, has been busy on these boulders as well as on all accessible dump-piles, and at no distant day we may look for these rare rocks to be shorn of their power as aids to the further development of a deserving camp, however watchful their local admirers may be.

There are but few developed properties in the camp. These I mentioned in a former letter. I made a fair examination of several pieces of property of great promise. One encouraging sign I found to be that development there almost invariably produces a paying mine. There are few camps in mining regions where there is less risk to judicious investments. Paying ore is found all along Cement Creek, after a depth of from 40 to 100 feet is gained. There is a ready market at Silverton, from which about 100 tons a day were shipped when I was there in the middle of August. The late summer, with an early winter, will cut the shipping season quite short. During my visit, there were slight snow-falls that reached somewhat below the timber-line, and rain every afternoon. The rainy season is now over (September 17th), and it is the best time of the year for all purposes to visit the Red Mountain country. T.

RICHMOND, Ky.

AMALGAMATING MILLS.—V.*

ARRASTRAS.

The arrastra is a simple and effective device for reducing ores, the legacy of the primitive but much underrated mining system of Mexico. Notwithstanding the slowness of its operation, it has not been entirely supplanted by the stamp and pan-mill, and still has a large field of usefulness. The arrastra is the prototype of the amalgamating pan; indeed, it combines to a certain extent in a single apparatus the function of stamps, pan, and settler. The leading advantages of the arrastra are, simplicity of construction and cheapness of first cost, thus placing it within the means of mine-owners having but small capital, and enabling it to be used during the period of development of mines, economy in working, and effectiveness in saving the precious metals of ores adapted to it when judiciously managed. Its disadvantages are the relatively small quantity of ore that can be treated in a given time and the fact that certain classes of ores are not suited to it, although this latter objection may also be said to apply to any particular type of stamp and pan-mill. Arrastras are still largely used in the United States, but of the several hundred scattered through the country a few only were selected for examination.

OWNERSHIP.—The great number of arrastras are owned in connection with small but productive mines. Of those that are owned independently of mining property, a few of the larger and best-equipped works are operated as custom mills, while the others are run on tailings. A large number of water-power arrastras are engaged in working over the tailings of the Comstock and other veins. Of the arrastras reported upon, nearly all have been constructed since 1876. As they are so often built merely as temporary make-shifts, it is natural that their average life should be short. Incorporated companies seldom own arrastra mills.

COST OF PLANT.—The crudest form of arrastra, to be operated by mule-power, can be built for $150. From this, the cost of construction ranges upward to $1000 for a substantial and large apparatus. Other plant is also involved in the better class of arrastra mills, such as the building, engine or wheel, ditches, flumes, pipes, retorts, and when pans, etc., are added, as is sometimes the case, the mill becomes an expensive affair. The cost, complete, of twenty-six mills, having ninety-two arrastras, is reported at $187,590, or an average of $5292 for each works, and of $1495 per arrastra, including all other plant. These mills, however, are of better construction than is usual, and their average cost is considerably above that of ordinary arrastras.

CONSTRUCTION.—The arrastra in its simplest form consists of a circular bed of rock from 6 to 10 feet in diameter, with walls of vertical planks, having an upright pivoted post in the center, from which extend two or four fixed horizontal arms. Stone drags, weighing usually from 200 to 1000 pounds each, are attached by ropes or chains to the extremities of the arms, and are slowly drawn around by the rotation of the latter. The depth is usually between 18 and 30 inches. The pavement and drags are of the hardest rock conveniently obtainable, commonly granite or basalt. Sometimes flinty quartz is used, but a coarse-grained rock that will not become too highly polished is preferable. The pavement is laid with much care, and should be quite solid, so that while the amalgam may collect in the small interstices, there should be as little loss as possible through leakage into the ground beneath. Hydraulic cement is sometimes used in setting the bed. The paving is usually 12 inches thick when new.

An improved apparatus, called the Americanized arrastra, has been introduced by Mr. A. B. Paul, of San Francisco. It is a double iron pan, the inner portion provided with a grinding muller similar to that used in common amalgamating pans, while a set of drags travels in the outer circle, which is 14 inches wide and 5 inches below the pan muller. It is run by water or steam-power, and is driven by bevel gear beneath the arrastra. A revolving amalgamated copper circle acts as do the aprons of gold batteries. The sizes made are 6 and 8½ feet in diameter. The latter size requires 5 horse-power, weighs 4½ tons, and has a capacity of from 7 to 10 tons in twenty-four hours, according to the hardness of the ore and the fineness to which it has been reduced before feeding.

DRAGS.—The number of drags used ranges from two to twelve per arrastra, the most common being four. There is also a great variation in their weight, the lightest reported being only 80 pounds, and the heaviest one ton, the mean weight, when new, being somewhat above 300 pounds each. The usual speed is from ten to fourteen revolutions of the arms a minute for power arrastras, the range reported being from four to eighteen. The outer drags in a 10-foot arrastra move at the rate of about 400 feet a minute when the arms make fourteen revolutions, though the average is between 200 and 300 feet a minute. The drags are made of the same rock as that used for the pavement.

LABOR.—One man per shift can take care of two arrastras. Some water-power arrastras working on tailings are so arranged that the only attendance needed is in feeding and discharging them, so that practically the labor required is less than the constant work of one man. The owner often does all the work. Continuous arrastras receive no attention other than that demanded for repairs.

POWER.—The smaller arrastras are worked by a single mule or horse. When water-power is obtainable, a small overshot, hurdy-gurdy, or turbine wheel is employed. The larger and more complete arrastra mills, which also include other apparatus, such as rock-breakers or stamps, are driven either by water-power or steam, and sometimes by both, using steam only in months when, because of drought or freezing, water is not available.

CAPACITY.—This varies greatly with the completeness of the plant and the character of the treatment, ranging from less than one ton to two tons a day for arrastras of the simplest pattern. In larger works, where rock-breakers and stamps relieve the arrastra of part of its duty, so that it acts simply as a grinding-pan, the capacity is dependent on the length of time necessary to complete amalgamation. A 12-foot arrastra driven by steam or water-power, with heavy drags making fifteen revolutions a minute, may dispose of two charges, of 4000 pounds each, of ore of medium hardness in twenty-four hours if very close working is not demanded, but this appears to be the limit of capacity. The annexed table shows the amount of ore treated during the census year by twenty-two specimen arrastra works, having fifty-three arrastras, few of which, however, were running very constantly. The average per mill was 413·75 tons, and for each arrastra 171·70 tons.

ORE TREATED BY TWENTY-TWO SPECIMEN ARRASTRA MILLS IN THE CENSUS YEAR.

STATE OR TERRITORY.	Number of works.	Number of arrastras.	Tons treated.
Total	22	53	9,101¼
Arizona	4	9	195
California	4	13	3,205
Colorado	2	6	284
Idaho	2	4	2,022¼
Montana	3	5	2,250
New Mexico	1	4	500
Oregon	6	12	645

TENOR OF ORE TREATED.—Arrastras are usually employed in working free-gold ores, although they also produce doré bullion. Very little ore as low in grade as $10 per ton is reported to have been worked in these mills, the average value being somewhat higher than that of ore treated in pan mills.

PROCESS.—The ore, after having been broken by hand or by a rock-breaker or stamps, is fed into the arrastra, a sufficient quantity of water being added to keep the pulp at the proper consistency. It is not customary to add quicksilver to the charge until it has been ground from two to four hours; but the chemicals, when used, are generally added on charging, though sometimes they are put in with the quicksilver. The quantity of quicksilver used is governed by the contents of the ore. In working gold ores, the object is to produce a pasty amalgam rather than a liquid one, while in treating silver ores, larger quantities are used, sometimes amounting to more than a pound of quicksilver to the ounce of silver in the ore. As assaying is not often practiced in connection with arrastra mills, the mill-man judges the tenor of the ore worked by panning out a sample of the pulp. No chemicals are commonly used with gold ores, although potassium cyanide in solution is sometimes employed to "liven" the quicksilver, and lye or wood ashes is used for the purpose of saponifying any grease which may have found its way into the arrastra. With silver ores, bluestone (or copperas) and salt are used, the quantities of each being very indefinitely regulated, as is the case in pan amalgamation. The length of time occupied in working a single charge is usually from ten to twelve hours. Toward the close, the pulp is thinned by the addition of water, and the speed of the drags is diminished, to give the amalgam an opportunity to settle. The arrastra is discharged by withdrawing successive plugs, arranged as in the common settler, or by opening a gate in the side. A clean-up is made after each run on custom ore, and usually once a fortnight if working steadily on the owner's ore.

The arrastra is sometimes used as an adjunct to the gold stamp-mill. At the Iowa mill, in Idaho, and in some works in California, the pulp flows continuously from the battery to a constantly working arrastra, and thence overflows through a gate near the top of the side upon amal-

* From the Census Report by G. F. Becker and S. F. Emmons. Compiled chiefly by Mr. J. S. Curtis.

gamated copper aprons and sluices. In this continuous process, a flask of quicksilver is charged in the arrastra at the beginning of the run.

SCALES & WAGNER'S ARRASTRA MILL, OWYHEE COUNTY, IDAHO.

This mill is selected for description as a typical example of the better class of arrastra work. It is situated on the west bank of the Jordan River, one mile south of Silver City, at a distance of from half a mile to 2¾ miles from the mines of Carson District and 10 miles from Wagontown District by road. The mill was originally constructed in 1874 at a cost of $60,000, and was intended to be a 10-stamp wet-crushing silver mill. It was bought by the present owners in February, 1877, and considerably improved, although a part of the old machinery had been previously removed. The building is a substantial one, partly of stone with brick facings and partly of wood, and is conveniently arranged.

The mill is designed to treat the richer ores of the district. These are of two distinct classes—a free-gold ore, and a silver ore of which the principal mineral is probably argentite, also containing gold. The gangue is a moderately friable quartz.

The plant consists of a light 10-stamp battery, two arrastras, three half-ton Wheeler pans, two settlers, and a retort. Power is furnished during eight months of the year by a 20-foot overshot wheel with 4-foot face, and in winter by a 30 horse-power horizontal engine.

The stamps are used in place of a rock-breaker, to prepare the ore for the arrastras, and thus save wear and time in grinding. Dry-crushing is employed. The mortars are open in front, without screens, and the ore is delivered in variable fineness, ranging from dust to pieces as large as hazel-nuts. One battery of five stamps, running four hours a day, usually supplies sufficient ore to keep the arrastras working.

The arrastras are on a floor immediately in front of and below the battery. They are driven by a bevel-crown wheel from the counter-shaft, and power is communicated to the latter by a belt and pulley. The inside diameter is 10 feet. The paving and drags are very hard, flinty quartz, obtained from a barren ledge about one mile south of the mill. Each arrastra has four drags, weighing from 250 to 300 pounds apiece. The speed is from twelve to fifteen revolutions a minute. A charge weighs 800 pounds dry, and the length of time occupied in working in the arrastra is ordinarily six hours, though with very rich rock the time is extended to eight hours. Four and a half hours after charging, when working gold or doré ores, the quicksilver is added, the proportion being determined by the assay of the ore. With silver ores, the amalgamation is performed in the pans, the arrastras then being used merely for grinding. The average amount of quicksilver used is 125 pounds per charge, though with the highest grade of ore this is increased to 200 pounds. With gold ores, a little lye is sometimes added. The treatment of silver ores in the pans is essentially the Washoe process, bluestone and salt being used in quantities ranging from 1 ounce to 2 pounds of the former and from 5 to 20 pounds of the latter, depending on the tenor of the ore. Both salt and bluestone are added on charging and in the dry state.

The arrastras are discharged by a plug-gate in the side, and the pulp flows directly into the pans through a wooden spout. Treatment in the pans and settlers is similar to that ordinarily followed in pan-mills. A clean-up is made after working each custom lot, and these parcels of ore are sometimes very small, amounting occasionally only to a half a ton or so at a time of carefully-sorted $500 or $600 ore. Amalgam is strained by hand through a canvas bag, and retorted in a cylindrical retort 3 feet 6 inches long and 9 inches diameter, having the vent at the center of the rear end. The time occupied in retorting is usually seven hours.

Tailings are worked in the pans by the same process as in the first treatment, with the exception that larger quantities of bluestone are used, ranging from 4 to 5 pounds per charge.

The arrastra pulp is sampled every half-hour as a check on the ore assays of customers, and tailings samples are taken from the settler discharge. The gold extracted by first treatment reaches 90 per cent, and the silver from 75 to 80 per cent.

The force employed in summer is as follows: Inside the mill, four men, at $4 each, per twelve-hour shift; outside, two laborers, at $3.50 per ten-hour shift. In winter, when steam is used, two engineers, at $5 each per twelve-hour shift, are added to the force. During the census year, the mill ran 330 days, and 22,440 hours' work were done. To treat a ton of ore, required twelve and seven tenths hours' labor (calculated as if done by one man). When in operation, the mill runs full-time.

As the mill works on high-grade ore, the process is necessarily an expensive one. The average cost of supplies during the census year, as will be seen from the accompanying analysis, was $3.95 per ton of ore treated. In this respect, the operations of this mill are to be considered as representative not of the average practice, but of the best.

SUPPLIES CONSUMED IN SCALES & WAGNER'S ARRASTRA MILL DURING THE CENSUS YEAR.

ITEMS.	Total consumption.		Consumption per ton treated.	
	Amount.	Cost.	Amount.	Cost.
Total	.....	$7,018.75	.....	$3.95
Red fir, cords	575	4.168.75	0·32	2 35
Quicksilver, pounds	3,000	1.440.00	1·69	81
Salt, "	14,000	420.00	7·89	24
Bluestone, "	3,000	750.00	1·69	42
Lard-oil, gallons	20	40.00	0·01	02
Chemicals and sundries	.....	200.00	.....	11

During the census year, the mill treated 1772½ tons, of which less than 300 tons were tailings. The lowest yield of ore per ton was $38, the highest $600, and the average $115.85. The tailings treated yielded about $9.50 a ton. The total product was $205,331.75.

The custom charge at this mill is $15 a ton for lots of 100 tons and over, $16 for lots of from 50 to 100 tons, and higher rates for very small parcels.

A PECULIAR SYSTEM OF HAULAGE IN THE ARLBERG TUNNEL.

Rziha, the well-known tunnel engineer, has recently described a system of haulage on the east end of the Arlberg tunnel, designed by Ceconi, that is peculiar, and has been remarkably successful in meeting the special circumstances of the case. From the portal at Langen, 1214 meters above sea-level, the tunnel has an up grade of 15 per 1000 for a length of 6170 meters to a hight of 1310 meters above sea-level, or a total rise of 92·55 meters; while from the St. Anton portal, 1302 meters above sea-level, it has an up grade of 2 per 1000 for a length of 4100 meters. The highest point in the tunnel, therefore, is located more than 2000 meters nearer the east end than the west end, and even if both tunnel headings had been driven at the same rate of advance, it would be necessary to hoist from the face of the east end over a section of 1200 meters with an adverse grade of 15 per 1000. This section, however, became much longer, owing to the fact that the western heading progressed much more slowly than the eastern. This rendered hoisting over the section in question a difficult matter, because the use of men and horses was out of the question, 200 of the latter being ultimately required. As the advance heading was driven only single-track width, chain or rope haulage would have been difficult, particularly because the space in the heading would be much contracted by guide-rollers and rope or chain. There considerations led Ceconi to use a wooden rod united in sections, on wheels running on the track, and hauled over the section in question by three Krauss locomotives in the following manner: The train, consisting of from 70 to 74 cars, was made up in the heading, and then the rod train was pushed into the heading until its end came into contact with the end of the train, and both were coupled together. Then the engines drew out rod and train on a side-track in the level part of the tunnel. Then they were uncoupled and the train of cars was switched on to the train track and hauled out of the tunnel by two locomotives, the wooden rod train being left standing on the side-track. After dumping, the car train was pushed back into the tunnel until the steep section was reached, and then was divided into single cars, which were run to the face of the heading singly with a man at the brake. The hauling therefore required from 70 to 74 brakemen and from 10 to 12 men on the rod train. The rod train consisted of 21 by 12 centimeter timbers 7·6 meters long, mounted on two four-wheeled trucks. In October, 1883, the rod train was 1070 meters long, and it will reach a length of 1200 meters. It weighs 52 kilograms per running meter, or 55 tons in all. A full train of 75 cars weighs about 230 tons, and an empty train, 262·5 meters long, 129 tons. There are ten trains in twenty-four hours, moving a gross weight of 3591 tons, an exceptional duty under the circumstances. An entire train with rod train has over 400 axles, and is 1400 meters long. The trains are run on regular schedule time.

THE WORLD'S TELEGRAPHS.—The telegraph appears to have made more progress in the United States than in any other country. The number of American telegraph offices in 1882 was 12,917, and the number of telegrams forwarded during the year was 40,581,177. The number of telegraph offices in Great Britain and Ireland in 1882 was 5747, the number of telegrams forwarded being 32,965,029. Germany had 10,803 offices, the number of telegrams forwarded being 18,362,173. France had 6319 offices, the number of telegrams forwarded being 26,260,124. Russia had 2819 offices, the number of telegrams forwarded being 9,800,201. Belgium had 835 offices, the number of telegrams forwarded being 4,066,843. Spain had 647 offices, the number of telegrams forwarded being 2,830,186. British India had 1025 offices, the number of telegrams forwarded being 2,032,603. Switzerland had 1160 offices, Italy 2590, and Austria 2696. The number of telegrams forwarded in these three last-mentioned countries was 3,046,182, 7,026,287, and 6,626,203 respectively.

TESTING EMERY FOR HARDNESS.—Mr. R. Jagnaux, of Paris, has written a letter to the editor of the *Génie Civil*, in which he explains his method of testing emery for hardness. He made analyses of different kinds of emery with the following results:

	Naxos.	Thyra.	Smyrna.
Corundum	64·2	55·8	56·4
Silica	2·0	7·2	7·0
Protoxide of iron	26·8	17·5	11·9
Peroxide of iron.	6·9	19·5	25·9
Total	99 9	100·0	100 0

In order to ascertain the relative hardness of these grades of emery, Mr. Jagnaux grinds one gram of emery between glass surfaces for a quarter of an hour and then weighs the glass. He thus obtains comparable figures. In the case of the three different kinds of emery given above, he found that the amount of glass ground off was 0·930 gram for the Naxos, 0·860 gram for the Thyra, and 0·810 gram for the Smyrna emery.

A TEST OF THE BUCHANAN MAGNETIC SEPARATOR.—Messrs. Ledoux & Ricketts, of this city, have made a test of the Buchanan magnetic separator, described by us some time since, from which we take the following figures: The ore employed was Beach Glen magnetite crushed to 8 inches and finer, the ore carrying 45·71 per cent of metallic iron. In the first test, 400 pounds of ore were run through in five minutes, a slow speed of feed, producing 300 pounds of concentrates. In the third test, 773 pounds were passed through in 3¾ minutes, yielding 535 pounds of concentrates, which carried 62·04 per cent of iron, while the tailings contained 7·94 per cent of iron. From the tests made, Messrs. Ledoux & Ricketts compute, without making allowances for stoppages, however, that the capacity of the machine would be 57·5 tons per twenty-four hours in the first test, 69·25 tons in the second, and 148 tons in the third, the average of the three being 91·67 tons per twenty-four hours. Comparing the analysis of the ores, of concentrates and tailings, they reach the conclusion that the machine saved 93 per cent of the magnetic oxide in the ore, which they pronounced a very satisfactory result, especially in view of the unequal pulverization of the ore and the slowness of the feed employed during the first two tests.

COPPER EXTRACTION AT STADTBERGE.

The copper mines at Stadtberge, Germany, recently visited by the Hesse section of the German Society of Engineers, have been worked at intervals since the year 1150. The ore mined is a large body of siliceous slate containing, finely distributed in it, small quantities of carbonates of copper in higher levels, and sulphurets in the lower parts of the deposit. For many decades, the process adopted for the extraction of the carbonate of copper, the maximum quantity of which was 3 per cent, was leaching with hydrochloric acid; but as the mines grew deeper, sulphurets set in and made that method impossible. Two years ago, experiments were begun looking to the treatment of the ore with cuprous chloride, and, thus modified, the process is now in use. The ore, crushed in crushers and rolls, is covered with mother liquor in large vats until it is thoroughly soaked with it after a few days. The ore is then taken out of the vats, and, dripping with solution, is made up into piles in which it is exposed to the action of the air for weeks or months. This exposure converts the sulphide into soluble chloride, which is extracted with hydrochloric acid. The copper is precipitated by iron in large agitators. There are treated annually at Stadtberge more than 50,000 tons of poor ore, which produces from 1000 to 1200 tons of copper, with a consumption of about an equal amount of scrap-iron and six times the quantity of hydrochloric acid. About 300 tons of copper are, besides, annually extracted from the old dumps, which are regularly moistened with mother liquor, and at their base discharge cupriferous liquors, from which the copper is precipitated in the usual manner.

FURNACE, MILL, AND FACTORY.

McGregor's Iron-Works, at Windsor, Canada, were burned September 18th. The Essex mills adjoining were also destroyed. Loss, $80,000.

The Norton Iron-Works, Ohio, will probably be in full running order in all departments the first week of October.

The Cincinnati (Ohio) Pump and Supply Company has assigned to A. M. Warner. It was incorporated in June, 1883, with an authorized capital of $100,000. The Davenport (Iowa) Pump and Pipe Company, which was interested in the Cincinnati concern, has given chattel mortgages for $76,000, and also a realty mortgage covering the business premises.

The first mortgage bondholders of the Vulcan Iron-Works of South St. Louis, Mo., held a secret meeting there September 18th, and it was decided to foreclose the mortgage. Some time ago, these works issued $1,000,000 bonds at 7 per cent interest, payable semi-annually. When the Vulcan Works were consolidated with other large iron and coal interests under the name of the St. Louis Ore and Steel Company, the latter assumed these bonds. Part of the interest due on them last March was paid, but some of the coupons were not presented, and the interest on them remains unpaid. Since that time, the Ore and Steel Company has passed into the hands of a receiver, and in the opinion of the bondholders, the company not being able to pay the over-due interest, they decided to foreclose the mortgage, and will take immediate steps with that view, and buy in the works when they are sold.

The rolling-mills of Huston & Sons, at Coatesville, Pa., after having been idle for six weeks, have resumed operations on full-time.

The Co-operative Stove Foundry, a new organization composed of practical molders, is erecting a foundry at Martin's Ferry, Ohio, for its new building.

The Norway mine, Mich., is having two 16-inch plunger pumps built by the Hodge Iron-Works, Detroit, and the plant will be duplicated for the Vulcan next year.

The Delaware rolling-mill in Philipsburg, New Jersey, has again been sold. Several weeks ago, it was purchased at a receiver's sale by Dennis Reilly, of Easton, for $23,000. Mr. Reilly has just sold it to F. P. Howell, of Danville, Pa. The property was owned several years ago by a party of Philadelphians, and it was then valued at $150,000.

Henry Bickford, manufacturer of machinists' tools at Cincinnati, Ohio, has made an assignment.

Mr. O. W. Porter, President of the North Chicago Rolling-Mill Company, states that there is no truth in the report that he has been holding any conference with his employés looking to a new scale of prices, etc.

The stockholders of the Lochiel Rolling Mill Company will hold a meeting on November 11th, for the purpose of deciding whether a loan shall be created by bond and mortgage upon the buildings of the company in South Harrisburg. The object is to secure proceeds to be used in improving the blast-furnace of the company.

RAILROAD NEWS.

Owing to the low stage of water in the Susquehanna River, traffic on the Tide-Water Canal, operated by the Philadelphia & Reading Railroad Company, has been suspended.

The Pennsylvania Schuylkill Valley Railroad was formally opened September 22d between Pottstown and Philadelphia. The opening of the road to Reading will soon take place.

The statement of the business of all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie for August, 1884, as compared with the same month in 1883, shows a decrease in gross earnings of $157,486; a decrease in expenses of $166,357; an increase in net earnings of $8885. The eight months of 1884, as compared with the same period of 1883, show a decrease in gross earnings of 1,318,681; a decrease in expenses of $819,364; a decrease in net earnings of $499,317. All lines west of Pittsburg and Erie for the eight months of 1884 show a deficiency in meeting all liabilities of $702,368, being a decrease, as compared with the same period of 1883, of $1,274,897. Clement A. Griscom has been elected director of the Pennsylvania Railroad, in the place of Henry M. Phillips.

LABOR AND WAGES.

The miners in the Belleville District, Illinois, tributary to the St. Louis market, have been digging coal at 2½ cents a bushel, and now want 3 cents.

A mass-meeting of workingmen was held under the auspices of the Socialistic Labor party in New York City, September 22d, to express sympathy for the striking coal miners of Hocking Valley. Resolutions in accordance with the object of the meeting were adopted.

The employés of the Chesapeake Iron-Works at Harrisburg, Pa., have been notified of a reduction of 10 per cent in their wages, to take effect in two weeks.

The Norfolk & Western Railroad Company has issued an order to the effect that, if any engineer joins the Brotherhood of Locomotive Engineers, he will be discharged. Three engineers who joined the organization refused to resign, and were immediately discharged.

John Ewing, Secretary of the Pennsylvania & Maryland Miners' Association, has issued a call for a reunion of the miners of Pennsylvania, Maryland, and West Virginia, to be held at Huntingdon, Pa., on October 1st, 2d, and 3d.

There are colored labor organizations forming in the South in connection with the Knights of Labor.

The Legislative Committee of the New Jersey State Federation of Trades and Labor Unions has called a Labor Congress to meet at Newark, on October 6th.

Notice is posted in the works of the Brooke Iron Company, of Birdsboro', Pa. of a 10 per cent reduction in the salaries and wages of the employés except the day laborers. The reduction is to take effect October 1st. The works employ altogether 600 hands.

The Columbus Trades Assembly has arranged for a mass-meeting at Columbus, Ohio, to take place September 27th. The meeting will be held in the interest of the Hocking Valley miners, who are now on a strike, and are living on charitable contributions. Hon. John McBride, President of the Ohio State Miners' Association, and several other speakers, will be present.

The employés in the 10 inch department of the Frankstown Rolling-Mill, Pa., have been informed that after September 27th their wages will be the same as those paid the 5-inch men, which is equal to $2 a ton.

Notices have been posted on the furnace of the Cumbria Iron and Coal Company, Hollidaysburg, Pa., announcing a reduction of 10 per cent in wages, to take effect on the 1st of October. All those who will not agree to accept the reduction will be paid off and discharged. When the wages are reduced, some of the employés will receive but 81 cents per day.

A dispatch from Shawnee, Ohio, to the Columbus *Dispatch* says: The idle miners are again making raids on the stock of the farmers for food, and scarcely a night passes but cattle are butchered in the fields and the carcases carried away. The prominent miners are unable to prevent the depredations. A large number of old miners are leaving the valley, and the syndicate is increasing its forces from foreign labor and negroes.

COAL TRADE NOTES.

ALABAMA.

Danner & Co., coal dealers and shippers, Mobile, made an assignment September 20th. The liabilities are $50,000.

CANADA.

PROVINCE OF NOVA SCOTIA.

The output of the Jaggin coal mines now is 150 tons daily. The slope is 1300 feet long, reaching a depth of 450 feet. The seam is nearly six feet thick, and is worked by 200 hands.

COLORADO.

The Colorado Coal and Iron Company's mine at Crested Butte, where the explosion occurred last January, will be abandoned. In place of it, the company will operate the new mine on the mesa just above the old workings. In all probability, miners will be put to work in the new mine about the 1st of October. They are in fifty-five feet, and have to go seventy feet more before coal is reached. Fourteen men are employed at the new works now.

The Mount Carbon Anthracite Coal Company, at Baldwin, is driving a tunnel and has already struck croppings. By the 1st of October, it will tap the main vein of anthracite. The tunnel is now in 900 feet.

MARYLAND.

Reports from Lonaconing for the week ended September 19th, show that Coney has been working full-time. Koontz, full-time. Old and New Detmold, full-time. Kingsland started yesterday, having been idle since August 14th. Jackson, about half-time. Hoffman, full-time. Eckhart, full-time. New Hope, full-time. Alleghany, half-time. Borden, quarter-time. Borden Shaft, about half-time. Franklin has been working better than usual, almost full-time. Hampshire, half-time. Potomac, full-time. Swanton, half time. Pekin, half-time. Ocean, full-time. Midland, about half-time. Miller, half-time. Phœnix started to work on Tuesday, being the first since the flood.

MISSOURI.

The Rich Hill Coal Company is getting out from 80 to 125 cars of coal a day.

MONTANA.

The San Coulee Coal Company has been organized in Minneapolis, Minn., with a capital stock of $750,000. This company owns 3500 acres of coal land, situated about eight miles from Great Falls City, on the Missouri River, north from Helena one hundred miles, a section of country noted for every element of prosperity. This land is drained by streams of water from the Missouri, and comprises an elevated plain five thousand feet above the surrounding country.

NEW YORK.

The schedules of Joseph K. Wells & Co., wholesale dealers in coal at No 1 Broadway, this city, were filed September 23d, showing liabilities, $235,902; nominal assets, $116,844; actual assets, $91,326.

OHIO.

At East Palestine, but little work was done at the mines during August.

Work at the mines at Salineville is somewhat brisker than it was during the summer.

The Jefferson Iron-Works, at Steubenville, have started up both of their coal-shafts. The low-down shaft, generally known as the Borland shaft, has begun at 75 cents a ton; the other, by the car, as formerly.

Reports from Chapman, dated September 16th, state that the coal business is rather dull this week in this locality. There has been nothing done yet in regard to demanding the usual fall advance of ten cents a ton. Willow No. 5 shut down a week ago, and Willow No. 6 worked only two days this week.

At Weathersfield, Pine Hill is shipping a couple of flats a week. Vaughn Brothers are doing a large retail trade. Mineral Ridge mines are doing better than they have been. Leadville worked four and a half days last week.

A new coal shaft north of Clinton, on the Cleveland, Mount Vernon & Columbus Railroad, is opening by the Pennsylvania & Ohio Coal Company. There are about fifty men at present mining, and the mine is running steadily.

PENNSYLVANIA.

ANTHRACITE.

The Lehigh & Wilkes-Barre Coal Company is putting down a shaft to the shaft that penetrates the Hillman vein at a depth of 700 feet. When the Hillman vein has been reached, both openings will be prosecuted to the Ross seam, which is thought to be located 1300 feet below the surface at that point.

About four months ago, the Hanover Coal Company began the sinking of a new shaft on its coal property below Wilkes-Barre, and it was to reach the Ross vein. The shaft was completed about two weeks ago, and the seam penetrated at a depth of 200 feet. In a few days, coal will be hoisted to the surface, to be prepared for market by the new breaker erected a few months ago. The vein was found to be fully ten feet in thickness. Two fifty horse-power, direct-acting hoisting-engines, which were manufactured at the Wyoming Valley Manufacturing Company's works, are now getting into position upon the plant. The company has heretofore been mining through a slope and tunnel, and the successful sinking of the shaft will hereafter do away with the slope, which is to be abandoned.

A timber falling on an ascending cage at Lawrence & Brown's colliery, Mahanoy Plane, caused an accident, September 19th, by which two miners were instantly killed and several others seriously injured.

George M. Dallas, special master under the receivership of the Philadelphia & Reading Coal and Iron Company, September 23d, filed his sixth report in the United States Circuit Court, at Philadelphia. The account of the railroad com-

pany shows a balance on hand on July 1st of $237,571.22, which, added to the receipts, makes a total of $4,309,735.58, and, after deducting the disbursements, a balance of $212,983.13 is left on hand. The coal and iron company's accounts show a balance of $2179.23 carried over, which, added to the receipts, makes a total of $1,162,345, and, after deducting the disbursements from the latter sum, a balance of $34,708.73 remains on hand.

A cave-in, covering an area of five acres, occurred at the Pleasant Valley mine of the Hillside Coal and Iron Company September 21st. The mine will probably be abandoned.

The Buck Mountain Coal Company's new breaker, near Mahanoy City, is getting under roof. It is expected that it will be ready to ship coal by the first of November.

The Buck Mountain vein, struck last Christmas at Morris Ridge colliery, is developing to the satisfaction of the operators. The slope has been made double-tracked, and the shipments have been very much increased.

The slope at Douty & Gaide's new Garfield colliery, at Shamokin, has been sunk to a depth of 100 yards below water-level, and gangways are driving east and west. The coal is excellent quality, and the facilities for preparing and cleaning it complete.

A mortgage was filed in the office of the Recorder of Deeds at Wilkes-Barre, September 25th, given by the Wilkes-Barre Coal Company to George S. Bennett and John M. Crane, of Wilkes-Barre, to secure the payment of $150,000 worth of bonds issued by the company, and made payable to the above-named gentlemen. The mortgage is on the extensive lands of the coal company in Kingston Township, and the bonds bear interest at 6 per cent per annum, and run for twenty years.

BITUMINOUS.

The Du Bois *Courier* gives the following report for August of the mines in the Fourth Mining District: Rochester mines worked 16 days, with 460 miners, and about 100 day-hands, including coke men. Prospects not very good.

Falls Creek mines worked 10¼ days, with 53 miners and 7 day-hands. Prospects fair.

Beechtree mines worked 14 days, with 110 miners and 25 day-hands. Prospects very poor.

Dagus mines worked chute No. 1, 11¾ days; chute No. 2, 13 days; chute No. 3, 14 days; with 250 miners and about 40 day-hands. Prospects poor.

Eureka slope worked 9½ days, with 97 miners and 12 day-hands.

Bucktail mines worked 16 days, with 100 miners and 30 day-hands. Prospects good.

Claremont mines worked 18 days, with 100 miners and 30 day-hands. Prospects good.

Pleasant Valley mine worked 16 days, with 100 miners and 7 day-hands. Prospects fair.

Hamilton mines worked 16 days, with 65 miners and 16 day-hands. Prospects at present three days a week.

Soldier Run mines worked 17 days, with 109 miners and about 35 day-hands, including coke men. Prospects fair.

Walston mines worked 20 days, with 185 miners and 100 day-hands. Prospects good.

The Cambria Mining and Manufacturing Company, which owns vast tracts of coal territory in the Alleghany Mountains, is leasing small tracts to Clearfield operators, who will develop them.

COKE.

The Connellsville Coke-Producers' Association met at Pittsburg, September 19th. The coke manufacturers say they will not furnish coke at less than the syndicate price, $1.10 a ton.

A scarcity of water in the Connellsville region is reported, and it is feared that a number of coke-ovens will be obliged to shut down on that account. The *Courier* reports that of the 9820 ovens in the region, 4043, or over 40 per cent, are idle. The idle ovens are distributed as follows: The 45 per cent pool shut down 3096; independent ovens, 156; furnace ovens, 422; old ovens, 369.

NATURAL GAS.

The small vein of gas struck September 18th, at Chess, Cook & Co's mill at Pittsburg, at a depth of 1230 feet, was exhausted in a short time. The well will be drilled 1500 feet deep, but from the indications, it is thought that gas will be discovered before that depth. No water has been struck since 600 feet. Already nearly 30 distinct strata have been pierced. One solid sand rock 142 feet in thickness was gone through. The firm has saved specimens of all the strata encountered.

The stockholders of the Penn Fuel Company, the Fuel-Gas Company of the county of Alleghany, and Emerson, Pew & Co., Limited, met at Pittsburg, September 17th, and elected directors and managers, but transacted no other business. It is stated that all the preliminaries for the consolidation of these concerns have been completed, and that the merging of all interests will be formally ratified at a meeting to be held in the near future. The Board of Directors of the Penn Fuel Company and Fuel-Gas Company is composed of the following gentlemen: J. N. Pew, H. Sellers McKee, William H. Alldred, Robert B. Brown, J. J. Vandergrift, Theodore Johnston, S. J. Brunot, Stewart McKee, D. Hostetter, E. O. Emerson, A. M. Long, George Trautman, and A. Hartupee. The managers of the firm of Pew, Emerson & Co., Limited, are: J. N. Pew, H. Sellers McKee, J. J. Vandergrift, George Trautman, and R. B. Brown.

Gas has been struck in the Zimmerman well, Brushton, at a depth of 1572 feet, the pressure of gas being 18 pounds. The drillers began work on this well on June 21st, but encountered many obstacles. Two veins of salt water were struck. The gas is perfectly dry, and was got 16 feet in the sand. Mr. Zimmerman said that he would make arrangements to pipe it into his glass factory on Washington street.

Jerry Martin has sold to Mr. Westinghouse one half-acre of land lying between the Murraysville and Verner gas-wells. This is the only available gas territory in that region.

UTAH.

The Home Coal Company at Echo, Summit County, has begun shipping six car-loads of coal a day to Salt Lake City.

VIRGINIA.

Reports from Lynchburg state that the Pocahontas mines are worked to their full capacity, and hundreds of cars of that coal have been shipped through there during the past week.

GENERAL MINING NEWS.

ARIZONA.

COCHISE COUNTY—TOMBSTONE DISTRICT.

TOMBSTONE.—The furnace blew in on the 18th inst., and the concentrating mill will start again October 1st. This will give a base bullion yield for the month of October. Returns of fine bullion will also be made soon after the reopening of the mines, as, until that time, there will be no ore on which to run the amalgamating mill.

PIMA COUNTY—QUIJOTOA DISTRICT.

QUIJOTOA.—The dry washer that will work the company's placers at the Horse-Shoe Basin will have a daily capacity of 75 tons, and the surface dirt is expected to yield, as shown by actual experiments, from $5 to $50 a ton, requiring only a force of ten men.

NORTH PEER.—This company, holding a claim which is, as the Mineral Bed, on the same lode as the Peerless (the Mineral Bed being an extension of the latter), is to resume work as soon as new arrangements are completed.

YAVAPAI COUNTY.

UNITED VERDE.—The Prescott *Journal* of the 9th ult. denies the statement that the company intends to close the works this winter. It states that the company not only proposes to continue running its smelters now in operation, but contemplates the erection of another. The mine continues to look better with each foot of new development.

CALIFORNIA.

EL DORADO COUNTY.

PLACERVILLE GOLD QUARTZ MINING COMPANY.—In the case of M. O. Thomas *vs.* the Placerville Gold Quartz Mining Company, the Supreme Court has denied the motion for a change of venue from San Francisco to El Dorado County. "A foreign corporation," says the court, "exists in and by virtue of the law of a foreign country, and no statute of this State has ever given a local (county) residence to such a corporation, where alone it can be sued. Its liability to be sued in the courts of this State no more confers a county residence upon it than does the comity which permits it to apply to our courts for the enforcement of a contract or the redress of a wrong."

MONO COUNTY—BODIE DISTRICT.

Reports for the week ended September 15th:

BODIE CONSOLIDATED.—One hundred and ninety-six tons of tailings were worked at the mill during the past week, of the average assay value of $6.50 per ton. There is no change of importance to note. Thirty-five men are employed.

CONSOLIDATED PACIFIC.—Drift on Pacific ledge No. 1 has been advanced 8 feet: total distance from chute, 60 feet. Ground still hard. The ledge is near 20 inches in width, and average assays constantly improving. Selected sample, to test small strata, went $176. Drift on Pacific ledge No. 2 has been advanced 8 feet. No material change either in size or character of ledge.

MONO.—A small force of miners has been put on the Mono, and the works started up.

STANDARD CONSOLIDATED.—They extracted and shipped to the mill 519 tons of ore and 640 tons of tailings. Received from the ore 555 ounces of crude bullion and from the tailings 423 ounces. Shipped to the company $13,443.50, of which $8151.82 are from two weeks' run on ore and $5291.68 from two weeks' run on tailings.

HOMER DISTRICT.

BRYANT.—This mine has paid its way from the start, and is regularly turning out bullion. The ore is all high-grade, and the vein averages three feet in width.

MAY LUNDY.—It is stated that this mine has been sold to an English company, after nearly two years' talk, and Lundy miners and merchants were to be paid $35,000 old debts, for which the mine has lately been under attachment.

NEVADA COUNTY.

NORTH STAR.—Work will probably start up early in October. The shaft is getting into better shape than ever before. The drain tunnel, which is 2600 feet in length, has been cleaned out one half its distance, and has been found in excellent condition, only a few sets of new timber being found necessary.

PEABODY.—This company, of Grass Valley, continues to yield high-grade ore. A recent crushing of 47 loads produced 176½ ounces of retorted gold, valued at $2963.44.

YUBA COUNTY.

A dispatch to San Francisco papers, dated Smartville, September 15th, says: The war of persecution waged by Marysville people against men who have been engaged in clearing bed-rock continues. Sheriff McCoy arrived here to-day with a number of warrants of arrest, charging parties with alleged contempt of court on August 8th. Hydraulic mining ceased here a year ago, which fact is known to the leading men of Marysville, who also are aware that the largest mines above this place are run to their fullest capacity, and no efforts are made to shut them down.

CANADA.

PROVINCE OF ONTARIO.

MICHIPICOTEN.—It is stated that the affairs of this company, of London, whose property is on the North shore, is to be put into liquidation, as sufficient funds can not be raised to carry on the work.

COLORADO.

CHAFFEE COUNTY.

Ten car-loads of limestone are shipped daily from the quarries at Garfield to the Leadville smelters for fluxing purposes.

MARY MURPHY.—Under the auspices of this company, the Alpine smelter was blown in September 11th. Every thing about the works moved in the most systematic manner, and a careful record is kept of all materials used and expenses incurred in running, so that the company will know the exact expense of handling the ores. Should this run prove successful, the remainder of the season will be an unusually active one in the extraction and hauling of ores, and many properties now idle will become steady producers.

SEDALIA.—This mine, near Salida, has lately disclosed quite a body of fine copper ore.

CLEAR CREEK COUNTY.

ARGO.—The Argo and Argonaut lodes and mill-site, property of the Argo Mining and Milling Company, situated in Cascade Mining District, were sold by the sheriff at Georgetown, September 15th, for debt, and were bought in by Messrs. Graham & Hutchinson, of Idaho Springs, for $1778.91.

COLORADO CENTRAL.—There are at present about 50 men employed in the mine, and the main work is confined to driving the 400 and 500 foot levels, which are operated day and night. No work is done above the 300-foot nor below the 500-foot levels, it being the intention to to put in heavier hoisting machinery and power-drills before resuming deeper work. Work preparatory to erecting the machinery has been commenced. The hoisting machinery will be run by compressed air, as well as the power-drills that will be used in the lower workings of the mine. These improvements will probably be completed during the winter.

CUSTER COUNTY.

BASSICK.—The machinery that is to be placed over and in the new shaft is arriving at Silver Cliff from San Francisco.

GILPIN COUNTY.

RICHARDSON & NIAGARA.—The syndicate recently formed to operate these mines, in Russell District, anticipates having the new plants of machinery on mines and mill in active operation by the twenty-fifth of this month.

VIRGINIA.—The lessees of this mine near the head of Virginia Cañon, after three months' hard labor, have finally opened up the vein into pay. They are now backstoping in the back of the 100-foot level, the mill-dirt from which is running 3 ounces gold per cord at the New York mill in Black Hawk, the smelting iron netting $70 a ton.

HINSDALE COUNTY.

CAPITAL CITY.—Work has been resumed by this company.

LAKE COUNTY.

The Leadville *Herald* reports the following:

ADLAIDE.—A new strike has been made that gives indications of opening quite a large and profitable ore-body. The mineral contains 45 per cent in lead, 35 ounces in silver, and one tenth of an ounce in gold to the ton.

ARGENT.—The purchase of the Vining mine and other properties of the Argent Mining Company, at the recent trustees' sale will result in a reorganization of this company. The bondholders, by whom the property was bid in, have proposed to take up the old stock of the company, amounting to 400,000, cancel the debt, and issue to the holders of the old stock one share of the new company's stock for every two shares now outstanding. The proposition will leave the old stockholders a portion of their interest, and free the property from all incumbrances.

ARGENTINE.—This group of mines on the north slope of Iron Hill, working under leases, is doing better than for a long time past. Some quite high-grade ore has been developed, and the shipments are fair. Last week, over two hundred tons of ore were sent to the smelters.

DENVER CITY.—The exploration-work inaugurated at the mine is advancing quite rapidly, and is proving very successful. The new drift shows about sixteen feet of ore, estimated, from numerous assays, to average from 25 to 30 ounces in silver to the ton.

EMMET.—Prospecting-work is pushed vigorously on this property, in California Gulch. A new shaft has been started on the top of the hill, and a twenty horse-power hoister purchased for the shaft. The shaft will probably have to go down over 250 feet, to strike the contact.

EVENING STAR.—Exploration-work by the company from the upper shaft continues with good progress. The Edwards level is in hard blue limestone, and the advance is slow. This level is driven to explore the upper contact in the extreme eastern end of the claim. The various lessees are all engaged in doing considerable new prospecting-work, with no very encouraging results to report. The parties who are working under a license the ground about the upper shaft are securing some ore.

IRON HILL CONSOLIDATED.—The property of the company, on Iron Hill, has been leased to Messrs. Bunker & Kyle, who are working portions of the property, and have sub-let the remainder. They are now taking out some fair ore from the north level, which is hoisted through the White Cap shaft.

MINNIE.—Mr. J. L. Loomis, manager of this mine, has tendered his resignation, to take effect October 1st. Mr. Loomis is manager of the Vining, and in addition is working the Agassiz mine under a lease. It is to give the latter more personal attention that he withdrew from the Minnie mine management. It is said that there are fifty applicants for the position.

MORNING STAR.—The result of operations last month was quite satisfactory. The company is working the mine contiguous and the Kitchen shaft, the Halfway shaft, the main Morning Star shaft, and the upper workings opened from the McHarg shaft. Lessees are working the upper and lower Waterloo shafts. The dumps scattered around the premises of the company are also worked, both in sorting and concentrating by hand jigs. The result of the past month's work from the different sources showed that 1324 tons of ore were produced worth $17,200. The concentration of the material on dumps by hand-jigs continues to meet with favorable results, the smelter returns showing the lead to be concentrated up to 40 per cent, making the average output of the Morning Star very desirable smelting ore.

NEW PITTSBURG.—The Ponsardine shaft on the New Pittsburg consolidation continues yielding some ore. The workings show about five inches of ore that returns assays of from 60 to 100 ounces of silver to the ton, and also contains considerable lead. A small lot of the ore was recently sent to the smelters that netted between $23 and $24 per ton. The water in the mine has nearly disappeared, and is readily handled with a bucket, greatly reducing the working expenses of the property.

WELDON.—A good working capital has been secured, and the shaft will be sunk to greater depth and provided with steam pumps. The mine has yielded some good ore in the past, and under proper management should prove quite productive.

PARK COUNTY.

CHICAGO.—These sampling-works are engaged in crushing a lot of slag from the dump of the old Dudley smelter that is reported as of a pay grade for shipment.

CRYSTAL LAKE.—The cold is already so intense upon Hoosier Pass that the stamp-mill of this company has shut down, and will not run again this year.

LONDON.—The mill is still dressing tailings, and with reputed good success.

NESTOR.—The gold taken from Nestor ore under the stamps will alone more than pay the expense of running both mine and mill.

SOVEREIGN.—The reduction-works projected to be built for this company next year will probably cost $250,000.

PITKIN COUNTY.

A new ore-market for Aspen mines has been secured in the recent opening of the Rose sampling-works at Crested Butte.

JESSIE BROWN.—The mine shows a pay-streak some 15 inches wide that averages 65 ounces of silver to the ton. This claim has also a lead of iron, from which an assay of 10 ounces of silver and a trace of gold were obtained.

PANDORA.—This group of mines, in Conundrum Gulch, has been worked considerably this season. The Pandora, upon which most of the work is doing, shows a vein twelve feet between walls, that assays from 90 to 500 ounces. The mineral is gray copper and brittle silver in quartzite.

VALLEJO.—The last payment of $5000 has been made on the Vallejo sale, which completes the $32,000 for the half sold by McMurchy, Kraft, Vandergrift, and Austin to George H. Hewitt.

RIO GRANDE COUNTY.

LITTLE ANNIE.—A correspondent sends us the following from Denver, under date of the 16th:

This mining property, which is famed for its rich gold ores, now comprises the lodes known as the Little Annie, Marguerite, Del Norte, Golden Queen, and Odin. The new acquisitions include neighboring properties that were owned by Senator Bowen and others. There are from 8000 to 9000 feet of tunneling in the mines, and all the tunnels are in ore. The ore is crushed at the mouth of the mine, and is conveyed to the sixty-stamp mill on an elevated railroad, working automatically. The ore is delivered to the bins and thence to the mill by self-feeders. The mill is managed with great ability, economy, and general efficiency, under the direction of Mr. C. W. Watson, the superintendent of the mines and works. The staff is well organized, and a rigid system of accountability is maintained in each department. All the work is done by a force of from 30 to 40 men. Mr. M. W. Cooper, of New York, who is a large stockholder, and chairman of the executive committee, resides at the mine, and is intrusted with the general supervision of the entire establishment. He has introduced important reforms, and so systematized the works that a great saving has been made, while the efficiency of the staff has been increased. The ore is mined and reduced at less than three dollars a ton, and this expenditure includes all that is paid for dead-work. About one ton of ore is pulverized by each stamp in twenty-four hours, and amalgam silver-plated copper plates, measuring 24 by 4 feet, are used for each five stamps. The residue from the mill is conveyed to a large vanner-house, 85 by 65 feet, containing sixteen improved Frue vanners, which produce daily from 1 to 1½ tons of concentrates, carrying from 8 to 30 ounces of gold a ton. Copper attachments have lately been added to the vanners, and are serviceable in saving the amalgam. The gold saved by the vanners, which had heretofore gone to waste, pays the entire expense of the mining and milling work. The motive-power for the mill and vanners is supplied by an engine of 175 horse-power, constructed by Fraser & Chalmers. The vanner-house is connected by cable rope with the engine, and the buildings are heated with the exhaust-steam. The engine is also used to produce electric light, which illuminates all the buildings. At night, the effect of this light is grand, and excites the wonder of old-time miners, who never expected to see the mountains illuminated by its splendors. The monthly product of the establishment is over 1000 ounces of gold, irrespective of the concentrates, which, as already stated, suffice to pay the entire current expenses of the mine, mill, and vanner-house. The net product of the mine is therefore large enough to pay a handsome profit on the investment. Some general items will complete this description. The veins are well defined, and there are sufficient bodies of ore in sight to insure an ample supply for many years. The water supply is abundant, and the buildings are substantial. The machinery is new and in good condition. Pine wood is used as fuel. Six cords, costing from $2.50 to $3.50 each, suffice to run all the machinery for twenty-four hours. The ore has been noted for its high grade, and is generally free milling. Development-work is carried on in the mines in addition to keeping the mill fully supplied with ore. From 90 to 95 per cent of the gold in the ore is procured by means of the mill and vanners. The engine and vanners were ordered from Mr. Trent, the efficient Denver agent of Fraser & Chalmers, who visited the mine, and gave his opinion as to the class of machinery that was required. The company was organized under the New York laws, and has its New York office at No. 145 Broadway. The officers are, Mr. Johnston Livingston, President; Col. Jonas French, of Boston, Vice-President; and Col. L. W. Winchester, Treasurer.

SAN JUAN COUNTY.

NORTH STAR.—T. C. Wilson and Julius Johnson, lessees of the North Star mine, located on King Solomon Mountain, Silverton, made an assignment September 15th, for the benefit of their creditors. The assets include their lease on the North Star and Wilson's lease on the Congress Copper mine and the Carbonate King. The North Star lease is valued by them at $50,000. September 17th, work was resumed on the North Star mine, arrangements having been consummated between the creditors and James S. Wood, representing the owner, J. J. Crooke, of New York, by which the product of the mine will be devoted to paying the creditors. The first accounts to be settled will be the wages up to September 1st, due to the miners who are now at work in the mine; then a *pro rata* will be paid to all of the creditors, including the merchants and the holders of time-checks, and wages from September 1st, until all is paid. On the present output of the mine, $1000 a day will be realized, and at this rate, the entire liabilities will be wiped out inside thirty days.

SUMMIT COUNTY.

CANFIELD.—This property is thoroughly exploiting. Four shafts are down to the full width of the vein, which averages 10 feet in width, and it pans in free gold, the whole width of the vein, an average of $20 to the ton. The shafts already sunk are over 100 feet apart, so that the vein is tapped for at least 600 feet, and two more shafts are sinking farther along. The company, it is reported, will erect a stamp-mill to treat the output.

ROBINSON CONSOLIDATED.—The mine is shipping about twenty car-loads of ore a month.

DAKOTA.

FATHER DE SMET.—The superintendent's report for the week ended September 15th shows ore extracted from the first, second, and third levels, 2100 tons. Ore milled, 2100 tons. Golden Gate east cross-cut, second level, advanced 12½ feet. Total length, 89 feet. Golden Gate uprise 5 feet. Rise up 31 feet.

GRAY EAGLE.—A portion of the smelter is now on the ground at this copper mine. The company is incorporated, and stock has been issued to the original owners of the mine.

KING SOLOMON.—It is reported that arrangements will soon be made for paying up the indebtedness and resuming work on the company's property, which was sold at sheriff's sale some time ago.

IDAHO.

HAILEY ORE CONCENTRATING COMPANY.—With a capital stock of $12,500, this company has been organized. It proposes to purchase, concentrate, and ship ores of all grades and kinds. Jabez Chase, present owner of the concentrating-works at Indian Creek, agrees to sell out to the company for one half of the capital stock, and will remain in charge as superintendent. Operations will begin in October.

VIENNA.—The 20 stamps of the mill are kept busy, and yield an average of two bricks of bullion per day, worth from $1300 to $1500 each. The owners of the mill intend to run it all winter.

MAINE.

PISCATAQUIS COUNTY.

During the past summer, an extensive vein of slate was discovered in the town of Guilford. The property was secured by D. W. Bennett & Son, of Guilford, who have since been engaged in opening the vein, and the prospect-work that has been done up to the present has demonstrated the discovery to be an important one.

MICHIGAN.

COPPER MINES.

FRANKLIN.—Superintendent Vivian writes that the lode in No. 5 shaft is showing very well indeed in all grades of mineral. The 18th level north of this shaft, now in about 675 feet, is not showing any thing of value at present.

HURON.—The general appearance of the mine is as good as at any time the last six months. Every thing will be cut down as low as possible, to meet the price of copper.

MINNESOTA.—The company has appealed from the verdict of $11,852.60 rendered in favor of the National mine in the suit for trespass, and has engaged the services of General Butler. The Minnesota must on appeal give bonds for double the amount of the verdict, and failing to do so, the property will be sold out to satisfy the judgment.

GOLD MINES.

ROPES.—The new mill at the mine is now inclosed, and the structure is ready for the machinery, a part of which has already arrived. The vein in the upper drift has a width of fully eight feet, and is rich in its showing of mineral.

IRON MINES.

Lake shipments of iron ore from the ports of the district for the week ended with Wednesday, the 17th, aggregated 84,391 gross tons, this being a slight gain on the amount sent forward by lake the preceding week. To this total Marquette contributed 42,749 tons, Escanaba 39,431 tons, and L'Anse 2211 tons.

BARNUM.—Work has been resumed at B shaft, new Barnum mine at Ishpeming, after a brief suspension of a few weeks. Two drifts will be started and the ground rapidly opened up. On surface, the arrangement of the dock, houses, etc., is nearing completion, and it would seem that it is the intention of the company to push mining work at this point vigorously. At A shaft, something like 190 tons per day are raised, and but a small force employed. The mine is in good shape, both underground and on surface for rapid production.

PENOKEE & AGOGEEBIC.—The Ashland *Press* is authority for the statement that arrangements have been completed by the Penokee & Agogeebic Development Company that will insure the shipment of at least one cargo of ore from the Montreal and Agogeebic range this fall, and institute regular mining work. From Capt. N. D. Moore, general manager of the company, it is learned that it has been decided to begin operations at the Colby mine, the property of the company, on section 15, 47, 46, Michigan, with a strong force of men, and take out a cargo of ore of about 1000 tons, and that arrangements have been made with the Milwaukee, Lake Shore & Western Railroad Company to carry it over that line to Milwaukee, where it will be shipped to Cleveland by vessel. The ore of this mine is of a superior quality, and the shipment is designed as a test sample, and will be used probably at one of the leading furnaces at Pittsburg. The ore is highly manganesian, and will be used for making spiegel. Con-

siderable work was done on the property several years ago by the Cambria Iron Company.

ROLLING-MILL.—A small mining force will be set to work at this mine, at Negaunee, as soon as it can be freed from water. The mine is unwatering.

MONTANA.

SILVER BOW COUNTY.

A novel scheme for the disposal of certain mining property is going on at Butte. The claims, which are to be disposed of by drawing, are yclept the Sunnyside, Silver Hill, and Eureka, and are situated in Silver Hill District. They are not developed properties, but are said to be promising prospects. On the Sunnyside, has been sunk one shaft of 8 feet and another of 30 feet in depth, showing a four-foot vein and two-foot pay-streak. On the second claim, the Eureka, are four prospect-holes about four feet deep, from which it is ascertained that the vein is compact, has a porphyry foot-wall and slate hanging-wall, the ledge itself being 70 feet in width. Mr. Blodget's enterprise is in the hands of Messrs. J. R. Clark, P. Largey, and Dr. Beal, who will act as committee of arrangements. At the drawing, the Sunnyside will be the first prize, the Eureka the second, and the Silver Hill the third.

MARYLAND & MONTANA.—The Margaret Ann, the property of this company, has a shaft 80 feet deep, and at that depth the vein shows eight feet of ore. The company has such faith in the mine that it has contracted for the erection of a fifteen-stamp dry-crushing mill. With a Howell chloridizing furnace, the works will be completed by January 15th, 1885.

LEWIS & CLARKE COUNTY.

NATIONAL.—The company, which owns valuable property on the east side of Red Mountain, will soon begin the sinking of a shaft, to be a hundred feet deep.

NEVADA.

STOREY COUNTY—COMSTOCK LODE.

CHOLLAR.—Messrs. Hayward and Hobart, directors of the Chollar Mining Company, have been fighting ex-Senator Sharon for control of the mine, and September 24th succeeded in obtaining it. A resolution representing a majority of the stock was presented in court at San Francisco, and the judge without prejudice allowed a new board of directors to be elected. The judge was to hear the Sharon party September 25th, in reference to the question of issuing certificates of election.

CONSOLIDATED VIRGINIA & CALIFORNIA.—A drift has been started north on the 1750 level, which will explore a large section of new ground lying to the northward of that portion of the old bonanza ground that was inclosed by means of bulkheads at the time of the fire in the old timbers, some years ago.

HALE & NORCROSS.—Sinking on the main incline winze below the 2800 level in Norcross has been resumed, and the north drift was discontinued September 13th. The winze will be down then a sufficient depth to permit the resumption of work in the north drift.

YELLOW JACKET.—A considerable amount of ore is still found, and some prospecting is done to open out further supplies. Water in the Carson River is falling, and the mills can not be run to their full capacity.

ESMERALDA COUNTY.

Farrington's new mill, between Garfield and Soda Springs, has started up.

EUREKA COUNTY.

EUREKA CONSOLIDATED.—The annual meeting of the company will be held on the 16th of October, at which a board of directors is to be selected. It is stated that some San Francisco parties, among them some of those who were directors during the time when the company was "in bonanza," will make a vigorous effort to secure the management. The trial of Percy G. Jacobus, ex-secretary of the company, on one of the fifteen charges of grand larceny, found against him by the grand jury, has been postponed until the 13th of next month.

NEW MEXICO.

BERNALILLO COUNTY.

CARIBOO.—This mine, at Fleming, has been purchased by Denver and other parties. This property was the first located in the camp, and there has been a considerable amount of work done. It is the intention of the purchasers to begin work on this property immediately.

COONEY.—Weekly shipments of ore and concentrates are regularly made from this property.

MIMBRES.—The mill is running on three-quarter time. Steady bullion shipments continue, and the output from the mines is steadily increasing.

GRANT COUNTY.

OLD MAN.—The company purchased for $2000 a half-interest in the Old Man No. 2 claim, which adjoins the Old Man on the southwest. The claim has been prospected and ore of a good grade uncovered.

SOUTH CAROLINA.

HAILE.—The large developments have justified the managers in increasing their plant by additional works having a capacity of 250 tons a day, which will carry it up to 300 tons a day. The company has entered into a contract with the Designolle people to treat the large beds of old tailings, estimated at 60,000 tons, which carry from $5 to $6 of gold per ton.

UTAH.

BEAVER COUNTY.

CAVE.—Shipments are made to the smelters near Salt Lake City, but no great amount will be shipped until the Utah Central Railroad puts in a branch of several miles in length from the terminus at Milford to the mine. The machinery run at the mine is in good working order. The ore is of the finest kind for smelting, being a carbonate with a heavy iron gangue.

SUMMIT.—This mine was recently purchased by C. Chambers and Lem Colbath, of Salt Lake City, for $19,000. This mine is really a north extension of the Cave mine and of the ore-deposits, and has all the appearance of it. Shipments of ore to Salt Lake have begun.

SALT LAKE COUNTY.

DURANT.—A syndicate has leased this ten-stamp mill at Bingham, with the privilege of buying, and is trying a new amalgamating-table for the gold ores. As much of the gold as possible is of course caught in the batteries. Then the material passes on to a table six feet in diameter, set on a pivot and revolving three hundred times in a minute. In the center of this table, is a bowl-like depression in which fifty pounds of quicksilver are placed; the rotary motion spreads this out on all the inner surface of the bowl. Surrounding this are copper riffles three or four inches high, between which similar riffles, set in the corner of the table, shut like teeth, leaving, however, space for the material to gradually work its way outward between them. One battery has been supplied with this table, and ten tons or so run through. Assays indicate that it caught more than seventy per cent of the gold, but not enough was done to make a thorough test. The table was invented by Mr. Schuler, assayer formerly for the Old Telegraph and for the Stewart, who has made a special study of the Bingham gold ores. Caveat has been filed for patent.

FRISCO CONSOLIDATED.—This company, at Bingham, has been attached by Parke, Lacy & Co., of San Francisco, and work has been suspended.

SUMMIT COUNTY.

AMPSON.—Work has been started at a pumping station at the 300 level.

WYOMING.

Mr. G. E. Bailey has tendered his resignation as territorial geologist and mining engineer of Wyoming, to take effect October 1st.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

GRANTED JULY 1ST, 1884.

301,105. Automatic Steam Pump Regulator and Water Indicator. William L. Fitch, Chicago, and William D. Smith, Keithsburg, Ill.
301,106. Machine for Bending Tubes and Pipes. Edward P. Follett, Rochester, New York, Assignor to the Follett Lantern and Manufacturing Company, same place.
301,124. Device for Preventing Percussion or Water-Hammering in Pipes. Francis Hyde, Toronto, Ontario, Can.
301,125. Hoisting Apparatus. Maximilian Jacker, Florence, Assignor of one half to the Marinette Iron-Works Company, Marinette, Wis.
301,147. Process for Preparing Old Steel for Reworking. William Parkinson, Hamburg, Pa.
301,153. Hoisting Apparatus. De Witt Clinton Prescott, Marinette, Wis.
301,184. Apparatus for Annealing and Galvanizing Wire. Ephraim Tucker, Jr., Worcester, Mass.
301,188. Coal-Boring Machine. Edwin Wall, Harmony, Ind.
301,222. Sulphur-Refining Apparatus. Ferdinand Dickert, Salt Lake City, Utah.
301,235. Rotary Engine. Thomas Alfred Hearsin, 5 Westcombe Park Road, Blackheath, County of Kent, England.
301,248. Treating Phosphates of Alumina and Iron. Gustav A. Liebig and John F. Gibbons, Baltimore, Md.
301,273. Balanced Pump. Haley S. Ramsey, Comanche, Texas.
301,281. Hoisting-Machine. Cornele G. Ross, Rutland, Vt., Assignor to the Lincoln Iron-Works, same place.
301,287. Valve-Motion for Steam-Pumps. C. Axel T. Sjogren, Denver, Colo.
301,322. Machine for Grooving Twist-Drills. Andrew R Arnold, Putnam, Conn., Assignor to Standard Tool Company, Cleveland, Ohio.
301,348. Air-Compressor and Exhauster. Peter Ehlers, Albany, New York, Assignor to Sullivan & Ehlers, same place.
301,349. Hand-Lever for Steam-Pumps. George Edmund Elliott, Calais, Me.
301,406. Manufacture of Alkaline Phosphates. Sidney Gilchrist Thomas, London, Eng
301,407. Manufacture of Alkaline Phosphates Sidney Gilchrist Thomas, London, Eng.

GRANTED JULY 8TH.

301,494. Apparatus for Breaking Down Coal. William Fairbairn Hall and William Low, Durham, County of Durham, England.
301,495. Miner's Lamp. John Hamilton, Bellevue, Pa.
301,525. Artificial Fuel. Auguste Romeau, Cleveland, Ohio.
301,557. Amalgamator Augustus C. Bowen, Michigan Bluff, Cal.
301,566. Machine for Cutting Sheet Metal into Oval Forms. Erskine A. Coles, Philadelphia, Pa., Assignor of one fourth to Frederick W. Troemner, same place.
301,605. Metallic Packing. Thomas Johns, The Dalles, Oreg.
301,613. Machine for Threading and Cutting off Tubes. William Maiden, James Maiden, and Egbert Fletcher Cowley, Hyde, County of Chester, England.
301,619. Amalgamator. Patrick McElligott, Bear Valley, Cal.
301,688. Puddling-Furnace. Edward J. Daschbach, Pittsburg, Pa.
301,708. Apparatus for the Treatment of Bones, Phosphatic Residues, etc. Carl Waldemar Flodquist, Molndahl, Sweden.
301,836. Rotary Engine. Caspar Schwartz, Werl, Prussia, Germany, Assignor to himself and Johann Hoffman, same place.

GRANTED JULY 15TH

401,859. Wind-Valves or Damper for Furnaces. Frank H Cathcart, Alexandria, Va.
301,927. Device for Constructing Tunnels. Duncan Shaw, Columbus, Ohio.
301,960. Mining-Machine. Francis T. Chew, St. Louis, Mo., Assignor of one half to the Ellsworth Coal Company, Danville, Ill.
301,992. Transmission of Power for Operating Pumps in Mines. Pierre A. Humbert, Virginia City, Nev.
301,993. Pump. Pierre A. Humbert, San Francisco, Cal.
302,065. Pump. Micah Walker, Port Huron, Mich.
302,088. Process of Purifying Iron. Joseph Beasly, Handsworth, County of Stafford, England, Assignor to John Howard Mitchell, Philadelphia, Pa
302,111. Machine for Operating Rock-Drills and Earth-Augers. Emanuel Davis, Eureka Springs, Ark.
302,113. Metal Roofing. John H. Dellmon, Pine Bluff, Ark.
302,130. Gas Generating and Consuming Furnace for Heating Retorts. Julius Theodor Hasse, Dresden, Saxony, Assignor to Stettiner Chamotte Fabrik Actien Gesellschaft, formerly Didier, Stettin, Germany.
302,152. Hoisting-Bucket. George H. Miller and Casimir Goyette, Pawtucket, R. I.
302,156. Apparatus for Pulverizing Sand, Ores, etc. James Nicholas, Illogan, County of Cornwall, England.
302,158. Process of Producing a Metal High in Phosphorus and Carbon and Low in Silicon. Jacob Reese, Pittsburg, Pa.
302,206. Air-Compressor. Herman Krutzsch, St. Louis, Mo., Assignor of one half to the St Louis Iron and Machine Works, same place.

REISSUE.

10,498. Device for Operating Tuyere-Stoppers. Henry W. Oliver, Jr., Pittsburg, Pa.

GRANTED, JULY 22D.

302,235. Twist-Drill. George H. Burroughs, Princeton, N. J.
302,242. Turbine Water-Wheel. Alonzo A. De Loach, Atlanta, Ga.
302,256. Ore-Pulverizer and Separator. Joseph D. Huntington, Chicago, Ill.
302,266. Treating Phosphates for Fertilizers. Gustav A. Liebig and John F. Gibbons, Baltimore, Md.
302,281. Miner's Squib. John R. Powell, Plymouth, Pa.
302,286. Corrugated Iron Roofing. L. Lewis Sagendorph, Cincinnati, Ohio, Assignor to the New York Iron Roofing and Paint Company, same place.
302,292. Tubular Drill. Albert Söderström. Stockholm, Sweden.
302,310 Mining-Machine. Bernhard Yoch. St Louis, Mo.
302,342. Rock-Drilling Machine. Smith W. Kimble, Denver, Colo.
302,349. Machinery for Making Molds for Casting. Matthew R. Moore, Indianapolis Ind.
302,350. Ore-Concentrating Apparatus. Frederick Morris, San Francisco, Cal., Assignor of one fourth to John H. Gyselaar, same place.
302,365. Furnace-Fire Feeder. Arthur Warne, Buffalo, New York.
302,424. Rock-Drilling Machine. A. Ingram Parsons, Jersey City, N. J.
302,427. Duplex Pumping Engine George H. Reynolds and Thomas J Rider, New York City, Assignors of one half to Cornelius H. Delamater, George H. Robinson, and William Delamater.
302,450. Apparatus for Carbureting Air and Firing Furnaces. Lester Valentine, Dayton, Ohio, Assignor of two thirds to James Hays and Elwood A. Stewart, both of same place.
302,504. Winding Apparatus for Mines. Arthur Lindenberg, Dortmund, Prussia, Germany.
302,520. Trip-Hammer. Isaac L. Penney, Minneapolis, Minn.
302,525. Metal-Screw Machine. Jakob Stelhi, Danbury, Assignor, by direct and mesne assignments, to himself and Amos F. Champlin, Hartford, Conn.

GRANTED JULY 29TH.

302,545. Ore-Jigger. Benjamin F. Cruzan and John J. Robinson, Webb City, Mo.
302,549. Mold for Casting Pipes of Plastic Material. Daniel H. Dorsett, Chicago, Ill.
302,566. Ore-Crusher. Joseph D. Huntington, Chicago, Ill.
302,600. Device for Manufacturing Twist-Drills. George R. Stetson, New Bedford, Mass., Assignor to himself and the Morse Twist-Drill and Machine Company, same place.
302,625. Revolving Ore-Roasting Furnace. Miles B. Dodge, San Francisco, Cal.
302,647. Machine for Chamfering Metal Plates. Etienne Bouhey, Paris, France.
302,705. Hoisting and Conveying Machine. Alexander E. Brown, Cleveland, Ohio.
302,706. Hoisting and Conveying Machine. Alexander E. Brown, Cleveland, Ohio.
302,712. Apparatus for Making Steel by the Bessemer Process. Alfred Davy, Sheffield, County of York, England.
302,715. Pump. Wilfred Eames, Evansville, Ind., Assignor to the Evansville Pump and Pipe Company, same place.
302,724. Furnace for the Manufacture of Glass, Iron, etc. Ignatius Hahn, Sharpsburg, Pa.
302,726. Twist-Drill Grinder. S. Ashton Hand, Toughkenamon, Pa.
302,816. Ore Concentrator or Separator. John W. Bailey, Denver, Colo.
302,817. Machine for Pulverizing Ores. John W. Bailey, Denver, Colo.
302,843. Submerged Force-Pump. Louis Herbert, Hicksville, Cal.
302,878. Miner's Safety-Lamp. Carl Wolf, Zwickau, and Heinrich Friemann, Eisleben, Saxony, Germany.

REISSUE.

10,502. Ratchet-Drill. Spencer Gardner, Adderbury, England.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Sept. 26.

Business continues about the same in the mining market. Dullness is the chief characteristic, and the dealings are generally small and within a narrow fluctuation from ruling prices. The Comstocks ruled steady, and seemed to be in fair demand. The Leadville stocks were almost neglected, and the Bodies were not much sought after. The Tuscarora stocks record only a small business. Horn-Silver was stronger although quiet. Below will be found a complete summary of the market. The total number of shares sold was 42,995, as against 54,470 last week.

The Comstock shares were fairly dealt in and sold at steady prices. California was quiet and steady, selling at from 31@35@33c. Consolidated Virginia records a fair business at irregular prices; it sold at from 22@27@24c. Sierra Nevada was also irregular, and was moderately dealt in; it sold at from $1.30@$1.40@$1.35. Union Consolidated was a little weak, selling at from $1.25@$1.15, with a small business. Mexican was also weak; it sold at from $1.55@$1.40, and was moderately dealt in. Ophir was quiet and steady, selling at from $1.15@$1.25. Gould & Curry sold at $1.90. Hale & Norcross records a small business at steady prices, selling at from $2.90@$3.10. Sutro Tunnel was very actively dealt in at irregular prices; it sold at from 19@16@18c.

The Leadville stocks were very quiet. Amie sold at 6c. Chrysolite records one small transaction at 88c. Breece sold at 26c. Little Chief was moderately dealt in at 28c. Climax sold at 2c.

The Bodie stocks were also very quiet, and ruled at steady prices. Bodie Consolidated was moderately dealt in, and sold at steady prices; it was quoted at from $2.25@$2.15. Standard records one transaction to-day at $1.40. Goodshaw sold at 14c. Consolidated Pacific was fairly dealt in at irregular prices; it sold at from 62@58@61c.

The Tuscarora stocks were quiet and steady. Grand Prize sold at 30c. Belle Isle was moderately dealt in at 55c. Navajo was strong, with a small business, selling at from $3.65@$3.95. North Belle Isle was also strong, selling at from 25@32c., with a small business.

In the miscellaneous list, Alice sold at $2.25, with one small transaction. Bassick records a small business at $5. Eureka Consolidated was quiet and steady, selling at from $3.50@$3.45. Gold Stripe records a small business at from 1@2c. Green Mountain sold at $1.60. Horn-Silver was moderately dealt in at strong prices, selling at from $6@$6.13.

Central Arizona was quiet and steady, selling at from 22@20c. Rappahannock records a small business at weak prices; it sold at from 14@10c.

MEETINGS.

Abbott Iron Company, Canton, Baltimore, Md., adjourned annual meeting of stockholders October 8th, at twelve o'clock M.

Little Chief Mining Company, No. 137 Broadway, Room 15, New York City, annual meeting of stockholders and election of trustees, October 7th, from twelve to two o'clock P.M.

Ophir Gold Mining Company, No. 30 Cortlandt street, New York City, annual meeting of stockholders and election of trustees, October 7th, at twelve o'clock M.

Silver Peak & Red Mountain Gold and Silver Mining Company, No. 52 William street, New York City, annual meeting of stockholders and election of trustees, October 8th, at twelve o'clock M.

DIVIDENDS.

Ontario Silver Mining Company of Utah has declared a dividend (No. 99) for August, of $75,000, payable September 30th. This will make the total dividends paid by the company $5,825,000.

United Coal and Coke Company, of Pennsylvania, gives notice that the coupons on the bonds of the company will be paid on October 1st at the Bank of North America, Philadelphia, Pa.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows for the week:

The petroleum market during the past week has fluctuated between 77¼c. and 70¾c. The most important disturbing factor in the market at present is the Phillips well, at Baldridge, Butler County, Pa. For nearly a month, this well has made an enormous production, and its staying qualities have greatly surprised and alarmed the trade. The territory in which it is located is hard and slow to drill and very expensive, and no well in its immediate neighborhood has been opened yet, but the Johnson well in that vicinity will soon reach the sand. Considerable interest attaches to this well, as it will go far toward determining the fertility of that territory. The trade is in a position to run quickly either way.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Sept 20....	$0.77	$0.77¼	$0.74⅝	$0.74⅞	5,798,000
22....	.74⅜	.74⅜	.70¾	.71⅝	9,166,000
23....	.71¾	.75⅝	.71¼	.74¼	6,575,000
24....	.74¾	.75¼	.73	.74¼	6,425,000
25....	.74	.75¾	.74	.75⅜	4,987,000
26....	.75⅝	.76¼	.73⅜	.73⅜	6,914,000
Total sales ...					39,865,000

SAN FRANCISCO MINING STOCK QUOTATIONS.

Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Sept. 19.	Sept. 20.	Sept. 22.	Sept. 23.	Sept. 24.	Sept. 25.
Albion						
Alpha						
Alta	1.75	1.75	2.00	2.12½	2.00	2.00
Argenta						
Bechtel						
Belcher		.80	.80		.80	
Belle Isle						
Best & Belcher	2.12½	2.12½	2.25	2.25	2.25	2.12½
Bodie	2.00	2.00	2.12½	2.00	2.00	2.00
Bullion						
Bulwer						
California			.35	.35		
Chollar	2.25	2.25	2.37½	2.50	2.25	2.75
Con. Pacific	.60	.60		.65		.60
Con. Virginia		.20	.20	.25	.20	.20
Crown Point				1.37½	1.37½	1.37½
Day						
Elko Cons						
Eureka Cons	3.25		3.25	3.25		3.25
Exchequer						
Gould & Curry	1.87½	1.75	1.87½	2.00	1.75	1.62½
Grand Prize						
Hale & Norcross	3.12½	3.12½	3.25	3.25	3.00	3.00
Independence						
Martin White						
Mexican	1.62½	1.62½	1.75	1.75	1.75	1.50
Mono						
Mount Diablo			2.25		2.37½	2.50
Navajo	3.62½	3.62½	3.75	3.75	3.75	3.62½
Northern Belle						
North Belle Isle						
Ophir	1.25	1.25	1.37½	1.37½	1.25	1.25
Overman						
Potosi	1.37½	1.37½	1.37½	1.50	1.50	1.25
Savage	1.25	1.37½	1.37½	1.37½	1.25	1.25
Scorpion						
Sierra Nevada	1.37½	1.50	1.50	1.62½	1.37½	1.37½
Silver King						
Tip Top						
Union Cons	1.25	1.25	1.25	1.25	1.25	1.25
Utah	1.25	1.25	1.25	1.25	1.25	1.25
Wales Cons						
Yellow Jacket			1.75	2.00	2.00	1.87½

Boston Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, Sept. 25.

The feature of the market the past week is the decline of $20 a share in Calumet & Hecla, from $160@$140, which is $2 below the lowest price touched the present year, and about $105 below the highest price for the past twelve months. The passing of one dividend, and the reduced rate of the last dividend, together with the decline in ingot copper, are the undoubted cause for this large decline in the stock. There has been considerable pressing of the stock for sale, and in order to find a market in the absence of buying orders, it was offered down until it found a level at which investors were willing to take it. About 150 shares were sold at from $150@$140, at which point it rallied to $142 for a small lot, and closed today at $142 bid, $144 asked. Quincy declined from $28¾@$28, but sales were light, and plenty of stock for sale at $28, with $27 as the best bid. It is very evident that, at present, copper stocks are not eagerly sought for as sources of investment, and so long as the production continues to exceed largely the consumption, there can be but little return to stockholders in the shape of dividends. There are but few mines in the country established on a paying basis, and unless the price for ingot copper should materially advance, the number will grow beautifully less. A small lot of Osceola at $9 and 100 shares of Huron at $1 constitute the rest of the transactions for the week.

In silver stocks, there is scarcely any thing doing. At the Boston Stock Exchange, not a single transaction is recorded. At the Mining Exchange, sales continue very light, and prices are rather lower. Bowman Silver declined to 8c. Dunkin, dull at 22c. bid, 25c. asked. Consolidated Pacific is about the firmest stock on the list, with sales at 60@63c. Sullivan is offered at 7c., and no takers. Water Meter stocks are dull and lower. An effort is making to introduce dealings in United Pipe Line certificates, which, it is believed will give new life to business at the Board, and materially add to the prosperity of the Exchange.

3 P.M.—The market for Calumet & Hecla was little better this afternoon; about 20 shares sold at $144, and the same price was bid for more, and none offered at less than $145. Quincy was $25 bid, $28 asked. Franklin, $5¾ bid, $7⅛ asked. Atlantic, offered at $8. Osceola, at $9, no sales. Huron, $1 bid.

BULLION MARKET.

NEW YORK, Friday Evening, Sept. 26.

DATE.	London. Pence.	N. Y. Cents.	DATE.	London. Pence.	N. Y. Cents.
Sept. 20	50 13-16	110¼	Sept. 24	50 13-16	110⅜
22	50 13-16	110¼	25	50 13-16	110⅜
23	50 13-16	110¼	26	50 12-16	110⅜

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting made no change in the bank's minimum rate of discount, and it remains at 2 per cent. During the week, the bank lost £273,226 bullion, and the proportion of its reserve to its liabilities was reduced from 45 3/16 to 44 13/16, against 47⅜ per cent at this date last year. September 25th, the Bank gained £8000 bullion on balance. The weekly statement of the Bank of France shows gains of 4,639,000 francs gold and 927,000 francs silver.

METALS.

NEW YORK, Friday Evening, Sept. 26.

Copper.—The week has passed quietly, without any features of interest. Lake is nominally 13@13¼c., and other brands remain within the range of 12@12½c., according to quality.

England cables £54 for Chili Bars and £58 10s. for Best Selected.

Tin.—The market is moderately active, within the range of 18@18¼c. for Straits, large lines, England cabling £81 for Tin.

Lead.—On Monday, the representative of some of the largest works in the country advanced his price to 3·75c., and during the week about 800 tons were sold at that figure to the trade, the lead being chiefly desilverized common and some refined. The market is now firmly held at the advance, but is dull. There is very little outside lead offering, and 3·80c. is generally asked.

From St Louis, Messrs. John Wahl & Co. telegraph to us as follows:

Since our last report, our market has risen, and there has been some excitement. It is now firm at the advance. Sales include 250 tons of Refined at 3·60c. Holders are firm, and are not offering much.

From Chicago, Messrs. Everett & Post send us the following dispatch to-day:

The market is rising, excited, and unsteady, and it is difficult to give exact quotations. We quote nominally 3·65c. There have been sales of 200 tons at 3·60c. There are more buyers than sellers in the market, and consequently prices are strong, scarcely any thing being offered.

Spelter.—There is very little doing in this market, and nominal quotations remain unchanged.

Antimony.—There have been no new features.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Sept. 26.

American Pig.—The market has remained fairly steady, but has not shown any signs whatever of improvement. Buying continues on a limited scale, while selling is not forced in any way.

We quote standard brands: No. 1 Foundry, $20@$21; No. 2, $18@$19; and Gray Forge, $17@$18, with outside brands from $1 to $2 lower. Foreign Bessemer is nominally $18.50@$19. Spiegeleisen has sold at $26.75, and is freely offered at that figure for 20 per cent.

Scotch Pig.—Arrivals are a little heavier.

We quote ex ship and to arrive: Langloan, $21.50;

Summerlee, $20.75 ; Dalmellington, $20 ; Gartsherrie, $21 ; Eglinton, $19.25@$19.50 ; and Glengarnock, $20@$20.50.

At the Metal Exchange, the following cable quotations have been received : Coltness, 59s. 6d. ; Langloan, 54s. 6d. ; Summerlee, 52s. 6d ; Gartsherrie, 52s. 6d. ; Glengarnock, at Ardrossan, 49s. 6d. ; Dalmellington, 47s. ; and Eglinton, 44s. 3d. Warrants, 41s. 7d.

Steel Rails.—The week has been a quiet one, with quotations at $27@$27.50, according to size of order.

Old Rails.—Nothing has been done. We quote nominally $17@$18.

Philadelphia. Sept. 26.

[From our Special Correspondent.]

Pig-Iron.—The heavy reductions in output have resulted in prices of the better grades of pig-iron being more firmly held, but demand for the past week has been very disappointing. Inquiry is rather more active, and a good many 100 and 200-ton lots are selling, but nothing is done in a large way, and on all but best irons prices are very low. A great deal of material has sold at and even below cost. In Foundry irons, prices range from $18@$21 for No. 1, according to quality. Average sales are made at from $19@$20. No. 2 is very dull. Gray Forge is moving slowly at $16@$17.50 delivered. There are rumors of stocks having been offered as low as $12 and $13 at furnace, but nothing definite can be ascertained on the subject. Inferior irons have sold at $16@$16.50. Many of the mills are out, or running only half-time, therefore the demand for forge is light, and must remain so until there is a general revival of railroad work, which will call for large quantities of material. Stocks of good irons are extremely light, and there are fewer offerings of inferior grades than a week or two ago. The market is in just such shape that an improvement in demand would immediately stiffen prices, but buyers seem to feel confident of being able to fill all requirements at present if not even lower prices, and it is impossible to induce them to anticipate requirements.

Foreign Irons.—Considerable sales of 20 per cent Spiegeleisen have been closed at from $26.50@$27, and there is a good deal of inquiry that may lead to more business. For small lots of from 10 to 12 per cent. $23 has been paid. Bessemer is without movement, and is quoted nominally at $19@$19.50.

Merchant Iron.—The consumption of bar-iron is considerable, notwithstanding all the complaint as to dull demand. But very few mills have much work on hand, and most of the orders coming in are small, as consumers will not take much more than a week's supplies at a time. Prices at city mills range from 1·90@2c. for best qualities of Refined iron, and at country mills, from 1·80@1·90c. There are no stocks anywhere ; but buyers, instead of apprehending an advance, are confident that they will yet be able to secure more favorable terms than are now offered.

Nails.—The starting in of several new nail factories within the past year has intensified competition, which, with the large producing capacity, would have been sharp enough without. But this, with the approach of the steel nail as a new competitor, puts the iron nail trade in rather bad shape. The new factories have cut prices down, and $2.10 is now paid for large lots, with a little less in some cases. Steel nails are moving at a slightly higher figure, and the demand is increasing.

Muck-Bars.—Small lots of Muck-Bars are selling at prices ranging from $29@$30, according to quality.

Plate and Tank-Iron.—There is nothing of interest to report in plate and tank iron. A fair average amount of business, composed of small orders exclusively, is coming along, and there is some inquiry for larger lots, but the market is without life. There is no change in quotations.

Structural Iron.—Quotations in structural iron are nominally as follows : Angles, 2·10c. ; Bridge Plates, 2 25c. ; Tees, 2·75c. ; and Beams and Channels, 3·50c. ; but heavy shadings could be secured on large lots. Prices have weakened under the slow, dull demand. No large orders have been placed, and there is no prospect of immediate improvement. Some of the mills are getting short of orders, and manufacturers are seeking anxiously for new business.

Steel Rails.—No very heavy transactions have been closed during the week, but a fair amount of business in small and medium orders has been done, and the market is in a satisfactory condition, with inquiry active and prices firm, at $27 for large, and $27.50 for small lots, at mill.

Sheet-Iron.—A good deal of both black and galvanized sheet is selling, but every one is buying from hand to mouth. Sales are all for immediate delivery, and prices are low, while the volume of business is considerably below that of last year.

Old Rails.—Holders of old rails are asking high prices, buyers are timid and not in great need of material, and hence no important sales have gone through. There are buyers of Tees at $17.50 in large lots, but holders ask $18@$18.50. Bridge Rails would sell at $20.50, and Bull-Heads at a shade under $20. Some small sales of Tees have been made at $18@$18.50.

Scrap-Iron.—There is some activity in small lots of good qualities at $19.50@$20 for No. 1, and other qualities at varying prices. Nothing is doing in large lots.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Sept. 26.

Anthracite.

There has been an improved demand, and an easier movement of coal ; but concessions are more frequently, more generally, and more openly made. Fair quotations to-day, f. o. b., are $3.75 for Stove, $3.25 for Chestnut and Broken, and $2.25@$2.40 for Pea. At Rondout, "wet" coal is selling at $3.40 for Egg and $3.60 net for Chestnut. While this freer movement looks well for the future on the face of it, it threatens to add to the indisposition of more of the companies to agree upon a reasonable restriction. What is desired more than any thing at the present time is the announcement at once of a further restriction in October and November. Should the demand improve so much as to render fuller work necessary, one week's stoppage may be easily recalled. As it is, however, the clamor for full work will receive encouragement, and prices will continue to suffer.

Bituminous.

Low freights and low prices generally continue to be the features of the business.

Philadelphia. Sept. 26.

[From our Special Correspondent.]

Stocks at Port Richmond to-day are 91,000 tons, of which 33,000 tons are broken, and only about 8000 stove and small stove, and 9000 tons chestnut. There is no change in freight rates, 90c. to Providence and $1 to Boston still being quoted. The demand from New England is still withheld, buyers there believing that there will be a break in the combination rates ; but our coal authorities here say that there is no probability of any such thing ; that a restriction will again take place next week, and afterward if necessary ; and that, if there is any change in prices, it will be an advance. Vessels are plenty. The scarcity of cars for shipments West is causing some trouble ; several Western points are ready for heavy stocks, but can not receive them until the grain crop moves Eastward and cars are in better supply. A good deal of coal is going to Buffalo. Retailers in the city are taking moderate stocks, but the warm weather prevents the activity that is usual at this time. Domestic consumers share in the belief that the "combination" will break, but are destined to be disappointed, and may have to pay well for their delay. The line trade is dull, but is expected to improve soon.

The bituminous trade is without interest, as usual. There is an active improvement on last spring's contracts, but nothing of importance is done in the way of business. Prices have not changed, and can not well go any lower. The production of the Clearfield region sent to Eastern markets last week was 66,141 tons, an increase of 14,437 tons over the production for the corresponding week last year. The production of the Cumberland region for the week last reported was 43,836 tons, against 38,845 tons for the same time last year, an increase of 4991 tons ; production for the year, to same date, 1,316,815 tons, against 1,183,032 tons, an increase of 133,783 tons.

Buffalo. Sept. 25.

[From our Special Correspondent.]

The stoppage of mining for one week, agreed upon by the combination, and to take effect on Monday next, your leading article of last Saturday and the article in *Bradstreet's* of the same day, have been the topics of conversation among dealers and producers here all the week. There is nothing to report locally on the situation of the anthracite, bituminous, and coke trades. I append my usual statistics and a few topics of interest, to show that the subject of the coal interest of the country is not dormant.

Coal freights since my last show an advance of 10c. per net ton to Chicago and Milwaukee, and a corresponding strengthening of prices to upper lake ports. Last Friday and Saturday, shippers inquired freely for tonnage, and every vessel that could be obtained was chartered. The engagements were at the following rates : To Chicago and Milwaukee, 50@60c. ; to Kenosha, Sheboygan, and Manitowoc, 70c. ; to Racine, 55c. ; to Superior City and Duluth, on contract ; to Detroit, Toledo, and Sandusky, 20c. ; to Green Bay, Mackinaw, St. Ignace, and Escanaba, 60c. Closing with no demand for vessels for the upper end of Lake Superior. Rates firm.

The shipments by lake from September 18th to 24th, both days inclusive, 49,000 tons ; namely, 23,310 to Chicago, 9440 to Milwaukee, 3650 to Detroit, 1990 to Toledo, 430 to Port Huron, 800 to Green Bay, 1000 to Superior City, 2800 to Duluth, 600 to Manitowoc, 1200 to Sandusky, 650 to Mackinaw, 290 to Sarina, 450 to St. Ignace, 600 to Escanaba, 210 to Port Dalhousie, 330 to Sheboygan, and 650 to Kenosha.

Complaints of a serious character are made at Chicago relative to the great delay in unloading vessels there, in consequence of the docks being crowded with coal.

With regard to coal freights by land, the nominal figures to New York are $1.40 per net ton and to Albany $1.25 per net ton and 10c. unloading. This morning, 1 load to Port Jackson, $1.05 per net ton, captain to pay unloading ; 2 loads coal-dust to Syracuse, 70c. per gross ton free on board, and captain to pay 10c. unloading.

Receipts by lake for the week, none.

Receipts by Lake Shore & Michigan Southern Railroad for the week, 1152 tons ; 1000 tons for Buffalo, and 152 tons for other points.

Receipts by canal for the week, 9692 tons. Shipments none.

Our genial townsman, Mr. R. R. Hefford, the President of the Common Council and the well-known merchant and shipper, has a ready wit, and sees in an instant the humorous side of matters and things in general. On a visit to the new coal-chutes and tunnel of the Lehigh Valley Coal Company on the Tifft farm, he was much surprised at the huge pile of coal over and around said tunnel. By means of this tunnel cars are loaded from above. The alderman gazed for a moment at the novelty and exclaimed, "COAL ON TAP." He was allowed to treat by his companions, and promised to reform !

This Tifft farm property has already 3000 feet of dockage, and this will be doubled by the end of November. The canal is 200 feet wide and 10 feet deep. The docks are laid out with streets and railroad tracks, the latter connecting with the Buffalo Creek Railroad, which enables all the railroads running into Buffalo to take advantage of the benefits brought about by this valuable and wonderful improvement.

The firm of Frank Williams & Co., which was dissolved by the death of the senior partner a few weeks bonce, will be continued under the old firm-name with Olive Williams, Horace A. Noble, and John R. Williams, of this city, and Robert H. Williams, of Oak Ridge, Pa., as partners.

The steam barge John B. Lyon came near being totally destroyed by fire last week. A candle used in the hold by the coal-trimmers was left burning on a beam under the boiler-house ; hence the disaster.

One of our coal dealers unburdened his mind to a reporter a day or two since. After stating that the bituminous trade was in a bad condition, he spoke of the efforts made to effect a combination to restrict production and regulate prices. Coal was selling below cost in very many instances. This state of affairs was due to the fact that a large quantity of coal was sent here on speculation. He concludes his statement as follows : "Now, some operators get a lot on hand, and say, 'Well, we'll send 200 cars to Buffalo, and perhaps we can catch those fellows short, and be able to sell it.' Well, they send it. We're not caught short, and these operators are obliged to

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Highest and Lowest Prices per Share at which Sales were Made.												SALES.
	Sept. 20.		Sept. 22.		Sept. 23.		Sept. 24.		Sept. 25.		Sept. 26.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.											2.25		50
Amie Con., Co.	.06												500
Argenta					5.00								200
Bassick, Co.													400
Belle Isle, Ne.	.55												400
Bodie Cons., Ca.	2.25		2.25		2.25						2.15		4'0
Breece, Co.									.26				100
Bulwer, Ca.													
California, Ne.			.32	.31	.35				35	.34	.33		3,200
Cal. & Hecla, Mich.													
Castle Creek													
Chollar													
Chrysolite, Co.			.88										25
Cons. Va., Ne.			.23	.22	.25	.24	.27		.26	.23	.25	.24	7,800
Copper Queen													
Dunkin, Co.													
Eureka Cons., Ne.					3.50				3.45				250
Father de Smet, Dk.													
Findley, Ga.													
Gold Stripe, Ca.			.01							.02			2,000
Gould & Curry, Ne.			1 90										100
Grand Prize, Ne.			.30										400
Green Mountain, Ca.											1.60		100
Hale & Norcross, Ne.	2.90		3.05						3.10				500
Hall-Anderson, N. S													
Homestake, Dk.									10.50		9.75		175
Horn-Silver, Ut.			6.00				6.00				6.13	6.00	750
Independence, Ne.													
Iron Silver, Co.													
Leadville C., Co.													
Little Chief, Co.									.28		.28		800
Little Pittsburg, Co.													
Martin White, Ne.													
Navajo, Ne.	3.80	3.65			3.85		3.85		3.95				1,000
Northern Belle													
North Belle Isle, Ne.	.32	.25											400
Ontario, Ut.					20.00		20.00						2 0
Ophir, Ne.	1.15		1.20		1.25								400
Quicksilver Pref., Ca.													
" Com., Ca.													
Robinson Cons., Co.													
Savage, Ne.													
Sierra Nevada, Ne.	1.30		1.35	1.30			1.40		1.40		1.35		770
Silver King, Ar.									4 25				30
Spring Valley, Ca.													
Standard, Ca.											1.40		800
Stormont, Ut.													
Tip Top, Ar.													
Vizina, Ar.													
Yellow Jacket													

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Highest and Lowest Prices per Share at which Sales were Made.												SALES
	Sept. 20.		Sept. 22.		Sept. 23.		Sept. 24.		Sept. 25.		Sept. 26.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Albion													
American Flag													
Barcelona, G.													
Bechtel Con., G.													
Belvidere													
Best & Bicher, G. S.													
Big Pittsburg, S. L.													
Bradshaw, S.													
Bull-Domingo, S.L.													
Cal., B. H., G													
Central Ariz'na, S.													300
Climax, Co.													500
Colorado Central.													
Cons. Imperial.													
Con. Pacific	.62	.61	.61		.62	.61	.61	.60	.59		.61	.58	2,300
Decatur													
Durango, G.													
Eastern Oregon													
Goodshaw, G.	.14												100
Harlem M. & M. Co.													
Hortense, S.													
Lacrosse, G													
Mariposa Pref., G													
" Com., G.													
Mexican, G. S.													
Mono													
North Standard, G.													
N. Horn-Silv'r, S L.													
Pri'nt'l & Miller, S.													
Rappahannock, G.													
Red Elephant, S.													
Ruby, of Arizona.													
Silver Cliff, S.													
Sonora Con.													
South Bodie, G.													
South Bulwer, G.													
South Hite													
South Pacific													
State Line, 1 & 4, S.													
" Nos. 2 & 3, S.													
Sutro Tunnel	.19				.18	.17	.18	.17	.17		.18	.17	15,300
Taylor Plumas													
Unadilla, S													
Union Cons., G. S.			1 20	1.15	1.20		1.25		1.20		1.15		850

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 21,345 Non-dividend shares sold, 21,650.

go to the consumer. They cut the price, and we are obliged to meet it. There are, probably, within the radius of a few miles, 1000 cars of coal sent to this market lying outside the city to-day. Now, just as soon as those 1000 cars are gone, there are 1000 others to take their place; and so it goes on." Now, if a pool were formed, this coal would not be sent, and a glut would be prevented; and if too much coal is mined, suspend operations until supply and demand are adjusted, are the opinions entertained. The aforesaid dealer summed up his catalogue of woes thus: "Why, to-day I could not offer to sell a man 1000 tons of coal. It would scare him so that he would imagine there was a glutted market and be expecting some other fellow to come along and offer him coal 10 cents a ton less. So you see he don't buy, and I can't sell. Of course, this state of affairs is a most unsatisfactory one."

Our Vanderbilt system of railroads will soon have another access to the great coal and iron regions of Pennsylvania. The South Pennsylvania Railroad is pushed forward with vigor, and through the Philadelphia & Reading road will connect with the railroads owned or controlled by Vanderbilt.

Our neighbors residing at the port of Erie, Pa. (on Lake Erie), are elated over the news contained in the following paragraph: "Mr. W. W. Reid, of Erie, a well-known railroad man, has been in conference with Eastern capitalists and others at Pittsburg with reference to the construction of a low-grade broad-gauge connecting line between that city and Lake Erie, the road to be called the Ohio & Lake Erie. The proposed line will be constructed on the bed of the old Pennsylvania Canal, from Greenville to Erie. It will be a direct connecting link over the Pittsburg & Shenango and Pittsburg & Western from Pittsburg to Erie. The traffic will consist largely of coal and Lake Superior iron ores. This project has no connection whatever with the new Castile Northern, but is an entirely separate and distinct concern."

The receipts of coal at Duluth for the week ended September 20th were 5800 tons; total thus far this season, 221,347 tons.

Boston. Sept. 25.

[From our Special Correspondent.]

The anthracite coal companies have not relieved the general distrust that has existed in this market, and hence affairs are unchanged. But very little wholesale business is reported, and the receipts have fallen off very largely. The restriction ordered for next week was eminently a part of the tactics that the coal companies have all along adopted. It will be made to count as restriction for the last week in September and the first week in October. Who would suppose from such tactics that the market was suffering from a glut of coal? The natural inference would be, that it was necessary to mine as much as possible before January 1st, 1885.

It is true that some companies are not sufficiently supplied, while others have more coal than they know what to do with; but in the eyes of this market, this fact only adds to the distrust in the permanency of the combination. Why not announce a proper plan of restriction for the next three months? No better stimulus could be given this market. Otherwise, the present state of trade will continue, especially in and about Boston, where competition among retailers makes close buying a necessity.

The jobbers still ask $4.25 for company stove coal at New York. The market for such coal as is bought is at $4@$4.10, and $3.90 is named on some transactions, but the coal at such figures is said to be of doubtful value.

At New York, Stove, $4.25; Broken and Egg, $3.50@$3.65; individual coals, $4@$4.10 for Stove, $3.25@$3.50 for Broken and Egg. At Philadelphia, $3.90@$4.05 for Stove, $3.65 for Chestnut, $3.35@$3.50 for Broken and Egg, $2.35 for Pea. Special coals, $4.85@$5 for Broken, $5.35@$5.50 for Stove.

In the outlying towns and cities dependent on this market, a better trade is reported, noting a fair pocket demand at circular rates of $5.50 for Stove, $4.90 for Egg, and $3.85 for Broken. Lawrence and Haverhill retailers are reported to be getting $7.50 and $7 a ton for stove coal, respectively. The latter place has a water freight.

The same quiet state of affairs exists with respect to the bituminous trade. It is doubtful whether there will be the usual number of contracts by December 1st. Certainly little or nothing is looked for before then. Culm of coal from Nova Scotia is coming along in a small way. With domestic coal selling at $3.50@$3.65 delivered, there is but a poor show for culm.

Further weakness is noted in freights. Prompt discharge insures 75c. from New York and 95c. at Philadelphia. Quotations are hard to give, as every freight is a bargain in itself nowadays. Thus, we hear of 85 cents through seven bridges. Less coal is pressing forward, which accounts for the weakness. We quote: New York, 80c.@90c.; Philadelphia, 90c.@$1; Baltimore, $1.15@$1.20; Newport News, $1@$1.10; Richmond, $1.15; Cape Breton, $1.50; Bay of Fundy, $1.30.

There has been an improvement in retail trade, caused by larger demands for immediate delivery. Prices can show no improvement with the wholesale market in its present condition. We quote:

White ash, furnace, and egg	$5.50
" " stove and nut	5.75
Red ash, egg	6.00
" " stove	6.25
Lorberry, egg and stove	$6.75@ 7.00
Franklin, egg and stove	7.50
Lehigh, furnace, egg and stove	5.75
" nut	5.75

Wharf quotations: $4.50, Broken; $4.85, Stove.

Columbus, Ohio. Sept. 23.

The strife in the Hocking Valley continues. The miners have become desperate, and the operators are all the more determined to manage their own business, as they put it. The fact that thirty or more of the strikers have recently gone to work on individual yearly contracts at 50 cents a ton, making in the neighborhood of 60 or 75 of them now at work, indicates that the operators are slowly but surely winning the victory. The output from the valley has now reached 130 cars a day, and I understand that the Columbus & Hocking Coal and Iron Company has arranged to put in 150 new men (colored) next week. The probabilities are, that by November 1st the output will be as large as the operators care to average, although guards will be a necessity for some time to come.

STATISTICS OF COAL PRODUCTION.

Belvidere-Delaware Railroad Report for the week ended September 20th:

	Week.	Year. 1884.	Year. 1883.
Coal for shipment at Coal Port (Trenton)	3,411	72,967	84,380
Coal for shipment at South Amboy	17,102	438,769	468,108
Coal for distribution	20,326	554,532	581,055
Coal for company's use	5,351	131,106	115,111
Total	46,190	1,197,374	1,248,654
Increase			
Decrease		51,280	

Comparative Statement of the Transportation of Coke over the Pennsylvania Railroad for the week ended September 20th, and year from January 1st:

Tons of 2000 pounds.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Gallitzin & Mountain (Alleghany Region)	2,712	96,466	1,113	59,360
West Penn. RR.	.....	24,865	3,572	75,689
Southwest Penn. RR.	28,958	1,598,451	40,201	1,514,236
Penn. & Westmoreland Region, Pa. RR.	3,712	138,289	3,910	160,397
Monongahela, Penn. RR.	997	54,815	....	.....
Pittsburg Region, Pa. RR.	.....	136	1,003	3,965
Snow Shoe (Clearfield Region)	325	16,769	219	13,356
Total	36,704	1,929,791	50,018	1,827,003
Increase	.....	102,788	.....	.....

FREIGHTS.

Coastwise Freights.

Per ton of 2240 lbs.

Representing the latest actual charters to September 25th.

Ports.	From Philadelphia.	From Baltimore.	From Elizabethport, Port Johnston, South Amboy, Hoboken, and Weehawken.
Alexandria	.65@.70	.....	.....
Annapolis	.....	.....	.....
Albany	.....	.....	.....
Baltimore	.58§	.....	.....
Bangor	.90*	1.15	.80
Bath, Me.	.70*	1.15	.75
Beverly	1.00	.....	.75
Boston, Mass.	.90@1.00	1.15@1.30	.70
Bristol	1.00	.....	.....
Bridgeport, Conn.	.....	1.05	.50
Brooklyn	.....	1.05	.....
Buffalo, N. Y.	.....	.....	.....
Cambridge, Mass.	1.10‡	.....	.70‡
Cambridgeport	1.00‡	.....	.70‡
Charleston, S. C.	.65@.75	.70	.....
Charlestown	90@1.00	.....	.70
Chelsea	.90@1.00	.....	.70
City Point	.....	.....	.....
Com. Pt., Mass.	.....	.....	.70
E. Boston	.90@1.00	.....	.70
East Cambridge	1.00@1.10	.....	.70‡
E. Gr'nwich, R. I.	.....	.....	.....
Fall River	.85@.95	.....	.70
Galveston	.....	2.40@2.50	.....
Gardiner, Me	1.10¶	.....	.....
Georgetown, D.C.	65@.70	.....	.....
Gloucester	1.00@1.10	.....	.....
Hartford	.....	.....	.....
Hackensack	.....	.....	.....
Hudson	.....	.....	.....
Lynn	1.10@1.15	.....	.....
Marblehead	.....	.....	.....
Medford	.....	.....	.....
Millville, N. J.	.....	.....	.....
Milton	.....	.....	.....
Newark, N. J.	.....	1.20	.....
New Bedford	.80@.90	1.00	.70
Newburyport	.....	1.30	.85
New Haven	.....	1.05	.50
New London	.....	1.00	.65
New-Berne	.....	.....	.....
Newport	1.00	.....	.70
New York	.....	1.00	.....
Norfolk, Va.	.60	.....	.....
Norwich	.....	1.15	.65
Norwalk, Conn	.....	.....	.50
Pawtucket	.....	1.25	.....
Philadelphia	.....	.....	.....
Portland, Me.	.65*	1 15	.70
Portsmouth, Va.	.60	.....	.....
Portsmouth, N.H.	1.00	1.20	.85
Providence	.85@.90	1.00	.70
Quincy Point	.....	.....	.....
Richmond, Va.	.80	.....	.....
Rockland, Me.	.....	.....	.....
Rockport	.....	.....	.....
Roxbury, Mass.	.90@1.00‡	.....	.....
Saco	.....	.....	.....
Sag Harbor	.....	.....	.....
Salem, Mass.	1.00@1.10	.....	.75
Saugus	.....	.....	.....
Savannah	.80	.90@1.00	.....
Somerset	.90	1.00	.75
Staten Island	.....	.90	.....
Trenton	.....	.....	.....
Troy	.....	.....	.....
Wareham	.....	1.25	.....
Washington	.65@.70	.....	.....
Weymouth	.....	.....	.....
Williamsbg, N.Y.	.....	1.10	.....
Wilmington, Del.	.....	.....	.....
Wilmington, N.C.	.....	.90@1.00	.....
St. Thomas, W. I.	.....	.....	.....

* And discharging. † And discharging and towing. ‡ 3c. Per bridge extra. § Alongside. ‖ And towing up and down. ¶ And towing. ** Below bridge.

Market quiet.

GEORGE W. JONES & Co.

Comparative statement of the production of anthracite coal for the week ended September 20th, and year from January 1st:

Tons of 2240 lbs.	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Wyoming Region.				
D. & H. Canal Co.	122,138	2,683,972	96,023	2,828,536
D. L. & W. RR. Co.	145,321	3,575,554	103,035	3,527,739
Penna. Coal Co.	30,832	900,792	33,796	1,026,007
L. V. RR. Co.	50,290	994,561	49,211	1,005,019
P. & N. Y. RR. Co.	6,978	159,590	4,837	151,261
C. RR. of N. J.	*	*	*	1,202,078
Penn. Canal Co.	14,167	292,681	17,818	334,832
North & West Br. RR.	15,573	597,090	7,641	316,591
	385,299	9,204,240	312,361	10,392,063
Lehigh Region.				
L. V. RR. Co.	120,810	3,190,621	112,349	3,541,079
C. RR. of N. J.	*	*	*	1,126,889
S. H. & W. B. RR.	915	132,960	.....	29,279
	121,725	3,323,581	112,349	4,697,247
Schuylkill Region.				
P. & R. RR. Co.	328,804	7,709,743	300,116	6,456,909
Shamokin & Lykens Val.	*	*	*	950,363
	328,804	7,707,743	300,116	7,407,272
Sullivan Region.				
St Line & Sul. RR. Co.	2,022	46,655	1,784	46,690
Total	837,851	20,282,219	726,610	22,543,272
Increase	.....	.....	.....	.....
Decrease	.....	2,261,053	.....	.....

* Included in tonnage of the Philadelphia & Reading Railroad.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Total same time in 1879 ..... 18,589,681 tons
" " " " 1880 ..... 16,134,269 "
" " " " 1881 ..... 19,891,642 "
" " " " 1882 ..... 20,444,997 "

The increase in shipments of Cumberland Coal over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 133,783 tons, as compared with the corresponding period in 1883.

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THE SCIENTIFIC PUBLISHING CO.,

27 Park Place, New York City.

P.O. Box 1833.

Comparative Statement of the Production of Bituminous Coal for the week ended September 20th, and year from January 1st:

Tons of 2000 pounds, unless otherwise designated.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Cumberland Region, Md.				
Tons of 2240 lbs.	66,821	2,018,901	59,148	1,797,183
Barclay Region, Pa.				
Barclay RR., tons of 2240 lbs.	6,862	216,106	7,161	227,573
Broad Top Region, Pa.				
Huntington & Broad Top RR., of 2240 lbs	4,763	139,273	4,548	135,298
East Broad Top	.....	.....	1,307	29,113
Clearfield Region, Pa.				
Snow Shoe	3,739	129,957	4,880	167,352
Karthaus (Keating)	2 056	33,888	.....	.....
Tyrone & Clearfield	65,924	2,233,563	51,251	2,005,10
Alleghany Region, Pa				
Gallitzin & Mountain	9,554	273,975	7,460	307,708
Pittsburg Region, Pa.				
West Penn RR.	4.814	199,928	2,655	286,066
SouthwestPenn.RR.	1,763	92,965	2,943	78,162
Pennsylvania RR.	3,468	197,258	13,885	427,463
Westmoreland Region, Pa.				
Pennsylvania RR.	25,995	932,319	29,210	1,002,677
Monongahela Region, Pa.				
Pennsylvania RR.	2,725	109,247	.....	.....
Total	198,484	6,577,380	184,448	6,463,695
Increase	.....	113,685	.....	.....

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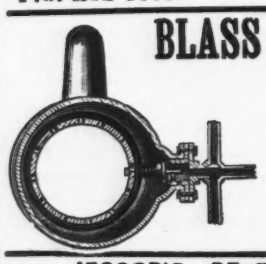

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